FEASIBILITY STUDY REPORT FOR OPERABLE UNIT 1 DOE/EA-0938

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

VOLUME 3 OF 3

OCTOBER 1994

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

FINAL

APPENDIX E

OPERABLE UNIT 1
COST ESTIMATE

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BASIS OF COST ESTIMATES

- Ancillary Facilities
- Waste Pit Excavation (5 Years)
- Waste Pit Excavation (10 Years)
- Waste Pit Backfill (5 Years)
- Waste Pit Backfill (10 Years)
- Pretreatment Facility
- Rail Siding and Silos
- Rail Siding Only
- Rotary Drying (5 Years)
- Rotary Drying (10 Years)
- Vitrification Equipment and Operation
- Cement - Solidification Equipment and Operation
- D&D - Vitrification
- D&D - Off-Site Disposal
- D&D - Cementation
- Shipping and Disposal - Nevada Test Site
- Shipping and Disposal: Permitted Commercial Disposal Facility
- On-Site Disposal Cell for Cementation
- On-Site Disposal Cell for Vitrification
- On-Site Surveillance and Maintenance
- Off-Site Surveillance and Maintenance
- Borrow Pit Restoration (10 Years)
- Borrow Pit Restoration (5 Years)

LIST OF ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cy	cubic yards
DOE	United States Department of Energy
FERMCO	Fernald Environmental Restoration Management Corporation
HEPA	High-Efficiency Particulate Air
lf	linear feet
NTS	Nevada Test Site
O&M	operation and maintenance
sf	square feet

E.1.0 INTRODUCTION

Cost estimates are used in the Feasibility Study process under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to eliminate those remedial alternatives which are significantly more expensive than competing alternatives but do not offer commensurate performance or health protectiveness.

The cost estimates are based on a variety of cost-estimating data including generic unit costs, vendor information, conventional cost-estimating guides, commercial remedial costs, professional estimating judgement, and previous similar estimates as modified by site-specific information. The categories of cost considered were: (1) capital cost and (2) operation and maintenance (O&M) costs. For the purpose of this estimate capital costs include the cost of constructing and operating the remedial and disposal facilities, and purchasing materials and equipment. Operating and maintenance costs are those incurred following the active remedial effort. Cost estimates were prepared to aid in the evaluation of alternatives using information currently available. The cost estimates presented are order-of-magnitude estimates with an intended accuracy range of -30 percent to +50 percent. Estimates are considered to be order-of-magnitude because of the uncertainties in the information used to develop the alternatives.

E.2.0 ORGANIZATION OF APPENDIX

Based upon initial screening results, four remedial alternatives were identified for detailed cost analysis. These remedial alternatives include:

- Alternative 4A: Removal, Treatment (Vitrification), and On-site Disposal
- Alternative 4B: Removal, Treatment (Cement Solidification), and On-site Disposal
- Alternative 5A: Removal, Treatment (Drying), and Disposal at the Nevada Test Site
- Alternative 5B: Removal, Treatment (Drying), and Disposal at a Permitted Commercial Disposal Facility

Alternative 1, No Action, was not included in the above list, even though it was retained for detailed analysis, because there are no costs identified with this alternative.

To estimate the costs associated with these remedial alternative, 22 cost component modules were developed. These modules, which are identified in Table E.2-1, were assembled to comprise the complete technical configuration for a proposed remedial alternative. Some modules, for example the module entitled "Ancillary Facilities", were used as components for all of the remedial alternatives. Some modules were used only for one alternative. In this way a complete cost estimate was developed.

Cost estimating information used in the detailed cost analysis of the selected alternatives is provided at the end of this section and is summarized in Table E.2-1.

The cost estimate developed for each cost component consists of the following:

- Narrative summary of cost component describing scope and major capital costs
- Estimating services sheet summarizing direct and indirect costs identified with the cost component
- Direct capital cost details sheet detailing major equipment and services costs

TABLE E.2-1

OPERABLE UNIT 1 REMEDIAL ALTERNATIVES COST SUMMARY

Cost Component	Estimate Number	Alternative 4A	Alternative 4B	Alternative 5A	Alternative 5B
Ancillary Facilities	C1-93-9-7-5	$9,639,476	$9,639,476	$9,639,476	$9,639,476
Waste Pit Excavation (5 Years)	C1-93-9-7		$63,300,482	$63,300,482	$63,300,482
Waste Pit Excavation (10 Years)	C1-93-9-7-A	$105,721,824			
Waste Pit Backfill (5 Years)	C1-93-9-7-2		$12,390,286	$12,390,286	$12,390,286
Waste Pit Backfill (10 Years)	C1-93-9-7-2-A	$22,761,895			
Pretreatment Facility	C1-93-9-7-4	$13,633,100	$13,633,100	$13,633,100	$13,633,100
Rail Siding and Silos	C1-93-9-7-6				$6,256,980
Rail Siding Only	C1-93-9-7-6R			$6,305,811	
Rotary Drying (5 Years)	C1-93-9-6		$78,265,742	$78,265,742	$78,265,742
Rotary Drying (10 Years)	C1-93-9-6R	$122,119,097			
Vitrification Equipment and Operations	C1-93-9-3	$242,892,775			
Cementation Equipment and Operations	C1-93-9-4		$141,427,913		
D&D Vitrification	C1-93-9-5-A	$10,835,586			
D&D Off-Site Disposal	C1-93-9-5-B			$7,828,297	$7,828,297
D&D Cementation	C1-93-9-5-C		$7,827,943		
Shipping and Disposal (NTS)	C1-93-9-4-A			$664,739,088	
Shipping and Disposal (Commercial)	C1-93-9-4-B				$321,736,197
On-Site Disposal, Cementation	C1-93-9-1-A		$197,961,981		
On-Site Disposal, Vitrification	C1-93-9-1-B	$126,632,772			
O&M On-Site Surv. and Maint. (annual cost)	C1-93-10-1	$280,796	$280,796		
O&M Off-Site Surv. and Maint. (annual cost)	C1-93-10-2			$63,722	$63,722
Borrow Pit Restoration (10 Years)	C1-93-10-A	$616,440			
Borrow Pit Restoration (5 Years)	C1-93-10-B		$616,440		
TOTAL CAPITAL COST (EXCLUDING O&M):		$654,852,965	$525,063,363	$856,102,282	$513,050,560

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E.3.0 COST ELEMENTS

E.3.1 CAPITAL COSTS

Capital costs are those expenditures required to initiate and implement the remedial effort. They also include the costs to maintain and operate equipment required to implement the remedial effort. Capital costs consist of direct and indirect costs.

E.3.1.1 Direct Costs

Direct field costs are those expenditures necessary for the actual, in-field construction/installation/operation of the remedial action including equipment, labor, and materials. Direct cost categories associated with remedial effort are identified below.

Excavation and Civil

These costs include clearing and grubbing of vegetated areas, implementing erosion and stormwater control measures, construction of roadways, installation of fencing, waste pit and building foundation excavation, construction of on-site disposal facilities (including leachate collection system, liner, and cap), operation and maintenance both during and following the remedial action, and decontamination and decommissioning activities.

Concrete

These costs include installation of concrete for building foundations and equipment footings (including form work and steel for reinforcement).

Structural Steel

These costs include structural elements for buildings (including columns, beams, siding), heating and ventilation equipment, and fire protection equipment.

Buildings

These costs include RUBB® building systems, SPRUNG® structures, and field support trailers.

Machinery and Equipment

These costs include the installation and operation of waste processing and off-gas treatment equipment. Costs associated with the purchase of additives required for waste treatment (i.e. lime and fly ash for cement-solidification and flux for vitrification) are provided as a separate line item within the cost estimate summary sheet so as not to artificially impact specific indirect costs.

Piping

These costs include installation of utilities to service the major facilities associated with the remedial effort.

Electrical

These costs include construction of substations and power usage by process and treatment equipment. Significant power usage costs (i.e. for the operation of the rotary dryers, vitrifiers, and cement-solidification equipment) are provided as a separate line item within the cost estimate summary sheet so as not to artificially impact the specific indirect costs.

E.3.1.2 Indirect Costs

Indirect costs are those costs required to support the design, construction, and management of the remedial effort. Indirect costs also include sales tax, escalation, risk budget, and contingency budget. These costs are added as percentages of the overall cost of the remedial effort. These percentages were developed and approved by the Department of Energy (DOE) for baseline budgeting efforts at the FEMP. Indirect costs associated with the remedial alternatives are identified below.

Supervision

Includes the labor cost identified with the contractors supervisory support staff. This cost is established at 17 percent of the total direct field labor costs.

Small Tools and Consumables

Includes the material cost identified with the purchase of small tools and consumables with individual values under $500 (e.g., shovels, hoses, welding rods, and hand tools). This cost is established at six percent of the total direct field labor costs.

Equipment Rental

Includes the material cost identified with the rental of construction equipment used on the remedial action (e.g., pickup trucks, backhoes, forklifts, and cranes). For standardized activities (clearing and grubbing), this cost is based on a rate of $3.50 per total direct field labor hour. For non-standardized activities (waste pit excavation), equipment rental cost is identified within the cost estimate detailing sheets.

Temporary Facilities

Includes the labor and material costs identified with the construction and installation of temporary buildings and structures required during the remedial action (e.g., tool sheds and equipment trailers). This cost is established at six percent of the total direct field labor costs (split 35 percent labor and 65 percent material).

Temporary Utilities Hook-Up

Includes the labor and material costs identified with the utility hook-ups to temporary facilities (e.g., electrical, sewer, and potable water tie-ins). This cost is established at three percent of the total direct field labor costs (split 35 percent labor and 65 percent material).

Job Clean-Up

Includes labor and material costs identified with the daily housekeeping activities to maintain a safe, clean work environment. This cost is established at six percent of the total direct field labor costs (split 35 percent labor and 65 percent material).

Safety

Includes the labor and material costs identified with the contractor jobsite safety meetings and supplies. This cost is established at three percent of the total direct field labor costs (split 35 percent labor and 65 percent material).

Health Physics

Includes the labor costs identified with lost time incurred by the contractor for monitoring delays, workers time for physicals, etc. For all activities, with the exception of waste pit excavation, rotary drying, and D&D, this cost is established as a percentage of the sum of total direct field labor costs and all indirect field labor costs identified above. For the purpose of the cost estimate, this percentage was established at 20 percent. This is consistent with the rates experienced for routine field activities at the site. For the remaining activities (i.e. waste pit excavation, rotary drying, and D&D), this labor cost is rolled into the direct field labor costs identified with the performance of the remedial effort. Higher rates were used for the waste pit excavation, rotary drying, and D&D efforts because these activities are expected to have more significant radiological monitoring requirements. The given rates were based on the estimator's professional judgement using the site-specific historical rates. A material cost for personal protective equipment required to implement these activities is determined explicitly in the cost estimate detailing sheets and provided under this direct cost.

CERCLA

Includes the subcontractor costs identified with site access and appropriate health and safety training for the contractors employees. This cost is based on a rate of $1,500 per 2,000 total direct field labor hours (i.e. approximately one man year).

Bond

Includes the subcontractors costs to bond the project. This cost is established at one percent of the total direct field costs.

Overhead and Profit

The allowance to the subcontractor to cover overhead and profit. This cost is established at nine percent of the sum of total direct field costs and all total indirect costs identified above.

Payroll Burdens and Benefits

The labor costs that the contractor incurs with each employee (including taxes, health insurance, social security, and long/short term disability). This cost is established at 52 percent of the sum of total direct field labor costs and indirect labor costs identified above.

Transportation and Burial

Includes the costs associated with transporting the treated waste to an off-site disposal facility. These costs are determined within the cost estimate detailing sheets and are not applicable to all cost components.

Waste Containers

Includes the cost of purchasing shipping containers used for transporting the treated waste to the off-site disposal facility and the labor associated with handling, filling, and documentation. These costs are determined within the cost estimate detailing sheets and are not applicable to all cost components.

Soil/Water/Air

Includes the real-time environmental monitoring (i.e., chemical and radiation) that will be performed during the remedial efforts. Also included is sampling and analyses that may be associated with a remedial effort (i.e., Waste Pit Area cleanup verification sampling and analyses, and on- and off-site disposal waste acceptance criteria sampling and analyses). This cost is typically established at one percent of the total direct field cost (split 35 percent labor and 65 percent material). For cost components which require the collection and analyses of large numbers of samples, this cost is determined within the cost estimate detailing sheets.

FERMCO Project Management

Includes project office labor costs not directly chargeable against the remedial effort. This cost is established at six percent of the sum of total direct and indirect field costs.

FERMCO Construction Management

Includes labor costs incurred by the FERMCO construction division. This cost is established at seven percent of the sum of total direct and indirect field costs.

Engineering

Includes the development of construction plans and specifications (e.g., Title I, Title II, and Title III design), operations and certification plans, contingency plans, emissions modeling, and DOE-required safety assessment reports. This cost is established at 17 percent of the sum of total direct and indirect field costs. Costs for engineering do not include RI/FS and related cost of treatability and miscellaneous field studies required to obtain the Record of Decision.

Sales Tax

Based on the total direct and indirect material costs. A sales tax of six percent has been applied to all capital equipment purchases. Although sales tax is not typically applicable to CERCLA remedial activities, the State of Ohio requires that sales tax be charged on all equipment purchased.

Based Estimate

The sum of the above identified costs is defined as the Base Estimate.

Risk Budget

The Risk Budget presented in the cost estimates is the additional cost added to the Base Estimate to compute the Target Estimate. There is a 50 percent probability that the final cost of the project will exceed (or come in below) the Target Estimate. The Risk Budget is determined by multiplying the Risk Percentage by the Base Estimate.

The Risk Budget is estimated based on an explicit procedure which accounts for the uncertainty deemed to present in the component of the cost estimate and was determined as described below.

A Monte Carlo Simulation model was used to evaluate risk and contingency for each individual cost component. The model computes the total project cost variability based on the estimated variability of each cost component comprising the total. The variability in each cost component is determined through a criteria-based analyses of the sources of cost uncertainty. For example, the effects of employing new technologies and the uncertainty in the quantity and the productivity of labor are among the factors evaluated to assess the variability in the estimate costs. A range is established for each criterion to suite the project conditions. The simulation program generates 2,000 samples within each of the established ranges of the estimated cost component and produces a frequency plot from which a curve is then drawn showing the probability of exceeding any given total cost level. Values for the parameters which the model uses in determining project risk and contingency were determined by a review team consisting of a remedial design engineer, construction engineer, and cost estimator. The effort was overseen by the cost estimator.

The risk budget associated with the cost components is provided within the cost estimate summary sheets.

Contingency Budget

The Contingency Budget presented in the cost estimates is the additional cost added to the Base Estimate and Risk Budget to compute the total Estimated Cost. The Total Estimated Cost is equal to the sum of the Base Estimate, Risk Budget, and Contingency Budget. There is a 5 percent probability that the final cost of the project will exceed the Total Estimated Cost. The Contingency Budget is determined by multiplying the Contingency Percentage by the Base Estimate. The Contingency Percentage is estimated in a manner similar to the Risk Percentage (previously described).

E.3.2 OPERATION AND MAINTENANCE COSTS

Those costs incurred after the remedial effort are considered post-remedial operation and maintenance. Each alternative identified for detailed analysis is associated with a post-remediation operation and

maintenance cost. Included in these costs are maintenance and repair of the disposal facility or multimedia cap, groundwater sampling and analyses, and maintenance and repair of groundwater monitoring wells. For cost purposes, the duration of these costs considered to be 30 years following the completion of remedial actions. These costs are identified with both the on- and off-site surveillance cost components.

E.4.0 PRESENT WORTH ANALYSIS

Present worth analysis provides a method of evaluating and comparing costs that occur over different time periods by discounting all future expenditures to the present year (fiscal year 1994). Thus, the costs for different remedial action alternatives can be compared on the basis of a single figure.

A discount rate of 4.5 percent (reflecting real interest rates) was used for the present worth calculations. This rate was obtained from Appendix C of the Office of Management and Budget (OMB) Circular No. A-94 and is recommended for programs with the durations of 30 years or longer. Present worth values based on this approach for the four remedial alternatives identified for detailed cost analysis are provided within Table E.4-1.

TABLE E.4-1

PRESENT WORTH VALUES FOR REMEDIAL ACTION ALTERNATIVES

Alternative[a]	Start Date	Duration of Active Waste Processing (Years)	Duration of Active Remedial Effort (Years)	Duration of O&M Following Remedial Effort (Years)	Total Present Worth[b]
4A	05/01/95	10	14	30	$457,740,000
4B	05/01/95	5	9	30	$404,903,000
5A	05/01/95	5	8	30	$645,870,000
5B	05/01/95	5	8	30	$389,509,000

[a] Alternative 4A: Removal, Treatment (Vitrification), and On-Site Disposal
Alternative 4B: Removal, Treatment (Cement Solidification), and On-Site Disposal
Alternative 5A: Removal, Treatment (Drying), and Disposal at the Nevada Test Site
Alternative 5B: Removal, Treatment (Drying), and Disposal at a Permitted Commercial Disposal Facility

[b] Discounted to fiscal year 1994 dollars

REFERENCES

U.S. Environmental Protection Agency, 1988a, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA," EPA/540/G-89/004, EPA, Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency, 1993, Memorandum for Offic eof Emergency and Remedial Response to EPA Regional Directors, OSWER Directive No. 9355.3-20, June 25.

ATTACHMENT I
TO APPENDIX E OF THE
OPERABLE UNIT 1 FEASIBILITY STUDY

BASIS OF COST ESTIMATE

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF ESTIMATE

PROJECT DESCRIPTION: ANCILLARY FACILITIES
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7-5
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

General site preparation for waste removal and processing activities is included under ancillary facilities. This cost component is applicable to all alternatives. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Site preparation would require clearing and grubbing an estimated 100,000 square yards (SYs) of vegetated area. The area would then be graded and contoured; filling would be performed where necessary. The volume of fill material required is estimated at 50,000 cubic yards (CYs) and would be obtained from excess on-site soils. Appropriate soil erosion controls and stormwater management measures would be implemented during site preparatory activities.

- Approximately 50,000 SYs of asphalt-paved access roadways and parking areas, to support a 100 person work force, would be constructed. Construction would include placement of approximately 54,000 tons of gravel sub-base obtained from local vendors.

- An estimated 5,000 linear feet (LF) of new chain-link fencing would be installed to isolate contaminated and process areas.

BUILDINGS

- Twelve (12) decontamination/changeout trailers and three (3) break/lunch trailers would be required to support remedial activities.

PIPING

- Approximately 3,000 LF of buried six-inch diameter water pipe, 18-inch diameter sewer pipe, and eight-inch diameter fire main would be installed to service the decontamination/changeout and break/lunch trailers.

ELECTRICAL

- An electrical substation would be installed to meet the power requirements of the site preparatory activities and the support trailers identified above (estimate includes power usage allowance for the decontamination/changeout and break/lunch trailers for a 60 month period).

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-7-5

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: FS/PP ANCILLARY FACILITIES

LOCATION: FERNALD

TASK#:

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	39,000		$643,890	$480,000	$486,000	$1,609,900
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS	3,240		$53,492		$552,000	$605,500
5		MACHINERY AND EQUIPMENT						
6		PIPING	18,300		$310,350		$240,000	$550,400
7		ELECTRICAL	17,400		$336,010	$30,000	$183,990	$550,000
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		77,940		$1,343,742	$510,000	$1,461,990	$3,315,800
11	SUPERVISION - CONTRACTOR				$228,400			$228,400
12	SM TOOLS/CONSM'BLS						$80,600	$80,600
13	EQUIPMENT RENTAL						$272,800	$272,800
14	TEMP. FACILITIES				$28,200		$52,400	$80,600
15	TEMP UTL'S HOOK-UP				$14,100		$26,200	$40,300
16	JOB CLEAN-UP				$28,200		$52,400	$80,600
17	SAFETY				$14,100		$26,200	$40,300
	HEALTH PHYSICS				$331,300			$331,300
	CERCLA	$1,500 PER PERSON				$58,500		$58,500
20	BOND					$33,200		$33,200
21	OVERHEAD & PROFIT					$410,600		$410,600
22	PAYRL BRD.&BENFT.				$1,033,800			$1,033,800
	INDIRECT FIELD COSTS				$1,678,100	$502,300	$510,600	$2,691,000
	DIRECT & INDIRECT FIELD COSTS				$3,021,842	$1,012,300	$1,972,590	$6,006,800
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$11,600		$21,600	$33,200
26	PROJ.MGMT-FERMCO				$360,400			$499,000
27	CONSTR MGMT-FERMCO				$420,500			$420,500
	FERMCO FIELD SUPPORT COSTS							$952,700
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$1,021,200
	ENGINEERING COSTS							$1,021,200
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$1,994,190	$119,700
	SUB-TOTAL (BASE ESTIMATE)							$8,100,400
32								
33	ESCALATION							
34	RISK BUDGET	12.0%						$972,048
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$9,072,448
	CONTINGENCY	7.0%						$567,028
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$9,639,476
37								

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT FS/PP ANCILLARY FACILITIES
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-7-5

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION AND CIVIL												
	CLEAR & GRUB, PARKING LOT,TRAILER AREA, ROADS & LAYDOWN AREA	100,000	SY	0.07	7000	16.51				$115,570			$115,570
	FINISH GRADE AND COMPACT	100,000	SY	0.07	7000	16.51				$115,570			$115,570
	FILL FROM ONSITE. THIS INCLUDES MINING ON SITE AND TRANSFER TO AREA.	50,000	CY	0.49	24500	16.51				$404,495			$404,495
	ROADS AND PARKING LOT												
	ASPHALT BASE COMPACTION	50,000	SY	0.01	500	16.51				$8,255			$8,255
	ASPHALT BASE MATERIAL	54,000	TON						$9.00			$486,000	$486,000
	ASPHALT 4" PAVING (SUBCONTRACT) LABOR = $50,000 MATERIAL = $350000 TOTAL = $400,000	50,000	SY					8			$400,000		$400,000
	CHAIN LINK FENCE LABOR TO INSTALL CHAIN LINK = $25,000 MATERIAL INCLUDING POSTS & RAIL = $55,000 TOTAL $ 80,000	5,000	LF					16			$80,000		$80,000
	TOTAL EXCAVATION AND CIVIL				39,000					$643,890	$480,000	$486,000	$1,609,890

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT FS/PP ANCILLARY FACILITIES
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–7–5

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	BUILDING												
	DECON, CHANGE TRAILERS 14' x 60'	12	EA	240	2880	16.51			43,000	$47,549		$516,000	$563,549
	BREAK LUNCH TRAILERS	3	EA	120	360	16.51			12,000	$5,944		$36,000	$41,944
	TOTAL BLDGS/ TRAILERS				3,240					$53,492		$552,000	$605,492

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT FS/PP ANCILLARY FACILITIES
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–7–5

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	PIPING												
	UNDERGROUND WATER PIPING 6" DIA, 6' BURY	3000	LF	0.50	1500	19.00			20	$28,500		$60,000	$88,500
	EXCAVATION,BEDDING & BACKFILL 5' DEEP	3000	LF	1.00	3000	16.51				$49,530			$49,530
	SEWER 18"	3000	LF	1.00	3000	16.51			25	$49,530		$75,000	$124,530
	EXCAVATION,BEDDING & BACKFILL 5' DEEP	3000	LF	1.50	4500	16.51				$74,295			$74,295
	FIRE MAIN/ PROTECTION 8"	3000	LF	0.60	1800	19.00			35	$34,200		$105,000	$139,200
	EXCAVATION,BEDDING & BACKFILL 5' DEEP	3000	LF	1.50	4500	16.51				$74,295			$74,295
	TOTAL PIPING				18,300					$310,350		$240,000	$550,350

000027

CLIENT– U.S. DEPT. OF ENERGY
PROJECT FS/PP ANCILLARY FACILITIES
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–7–5

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	ELECTRICAL												
	ASSUME 13.2KV SUBSTATION	1	EA	5000	5000	19.39			50000	$96,950		$50,000	$146,950
	UNDERGROUND ELECTRIC DUCT WORK ALLOWANCE	1	EA	5000	5000	19.39			18050	$96,950		$18,050	$115,000
	CONCRETE FOR SITE ELECTRIC DUCT WORK,ALLOW	1	EA	800	800	17.67			26600	$14,136		$26,600	$40,736
	INTERIOR LIGHTING , ALLOWANCE	1	EA	1200	1200	19.39			17000	$23,268		$17,000	$40,268
	CONDUITS AND WIRES FOR INTERNAL LIGHTS,ALLOV	1	EA	1980	1980	19.39			6000	$38,392		$6,000	$44,392
	EXTERIOR LIGHING , ALLOAWANCE	1	EA	1020	1020	19.39			12000	$19,778		$12,000	$31,778
	ELECTRIC SWITCHES, PANELS AND CONTROLS SECURITY CONNECTIONS ETC. ALLOWANCE	1	EA	2000	2000	19.39			7000	$38,780		$7,000	$45,780
	ELECTRIC USAGE @ $1000/MONTH FOR 60 MONTHS	60	MO					500			$30,000		$30,000
	EMERGENCY LIGHTING GENERATOR SET, ALLOW	1	EA	400	400	19.39			47340	$7,756		$47,340	$55,096
	TOTAL ELECTRICAL				17,400					$336,010	$30,000	$183,990	$550,000

000928

2609

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: WASTE PIT EXCAVATION (5 YEARS)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Waste would be removed from the waste pits using both dry and wet excavation methods. Removal rates would be directly related to the treatment through-put rates (i.e. maximum production capacity of the waste treatment facility). Labor and equipment hours for pit excavation are based on the daily capacity of the drying equipment. Excavation equipment is sized to accommodate the expected field conditions and the physical nature of the waste. This cost component is applicable to Alternatives 4B, 5A, and 5B. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- The total estimated quantity of material that would be removed from the Waste Pit Area is estimated at 1,004,300 dry tons (approximately 710,000 cubic yards). This includes 893,800 dry tons of waste, cap material, and liner, and an additional 110,500 dry tons of residual surface and subsurface soil.

- Waste removal would be planned to match the treatment processing rates to avoid the need to stockpile and double handle the removed materials. An estimated 5 years would be required for waste removal operations.

- The labor hours for waste excavation activities associated with this cost component, based on operating in Level D conditions, was estimated at 190,440 labor hours. Since the majority of the personnel associated with waste excavation activities would be expected to work in Level B conditions, this quantity was multiplied by a productivity factor of 2.1 to yield 399,924 total labor hours, or the effort required to execute the same activities in Level B conditions.

- Approximately 6,000 linear feet (LF) of 20-foot wide asphalt-paved roadways would be installed connecting the waste pit area with the pretreatment facility. The roadways would be lined with four-inch berms to control the flow of water generated during daily washdown operations.

BUILDINGS

- A 20,000 SF SPRUNG® structure placed on a concrete slab would be constructed to provide an enclosed area for equipment storage and maintenance.

EQUIPMENT RENTAL

- Excavation and transport of dry pit wastes, caps, liners, and subsurface soils would be accomplished with standard earth moving equipment. Equipment operating in the waste pits would be equipped with enclosed cabs with supplied breathing air.

- Wet pit wastes would be removed with the existing Pit Hog dredge and pumped to the pretreatment facility.

HEALTH PHYSICS

- For cost estimating purposes, Level B personal protective equipment would be required for an estimated 25,000 man days.

SOIL/WATER/AIR

- Confirmatory sampling would be performed within 50-foot by 50-foot grids covering the entire surface area of the operable unit. For costing purposes, it is assumed that 50 percent of the grids sampled would fail initial testing relative to established action levels and one round of additional sampling and analyses would be required. Assuming a total surface area of approximately 37.7 acres (1,642,218 square feet (SF)), approximately 1,000 samples would be collected and submitted for analyses, which would include metals, volatile and semi-volatile organic compounds, pesticides, PCBs, dioxins, and radiological constituents.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

- Excavation activities associated with Alternatives 4B, 5A, and 5B would be conducted over a five year period where the same activities would be conducted over a 10 year period for Alternative 4A. Since equipment, labor, and escalation costs are based on the duration of the activity, the total cost identified with waste pit excavation for Alternatives 4B, 5A, and 5B is therefore less than that identified with Alternative 4A.

- Given that excavation equipment is sized primarily to accommodate the expected field conditions and physical nature of the waste encountered during excavation, capacities and quantities for identified pieces of equipment are identical for both the five and ten year waste excavation efforts. However, since the duration of the efforts and the excavation rates differ among the efforts (as dictated by the treatment process), the equipment rental term and operating hours associated with each identified piece of equipment is not identical for both efforts. Additionally, since the identified core labor force is primarily based upon the quantity of equipment required to perform the excavation activities and that the equipment requirements are the same for both efforts, the labor force would essentially remain constant for both efforts.

EST FILE #: C1-93-9-7

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: WASTE PIT EXCAVATION (5 YEARS)

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	400,488		$7,260,088		$87,940	$7,348,000
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS				$300,000		$300,000
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		400,488		$7,260,088	$300,000	$87,940	$7,648,000
11	SUPERVISION - CONTRACTOR				$1,234,000			$1,234,000
12	SM TOOLS/CONSM'BLS						$435,600	$435,600
13	EQUIPMENT RENTAL					$6,867,415		$6,867,415
14	TEMP. FACILITIES				$152,500		$283,100	$435,600
15	TEMP UTL'S HOOK-UP				$76,200		$141,600	$217,800
16	JOB CLEAN-UP				$152,500		$283,100	$435,600
17	SAFETY				$76,200		$141,600	$217,800
	HEALTH PHYSICS						$6,250,000	$6,250,000
	CERCLA	$1,500 PER PERSON				$300,400		$300,400
20	BOND					$76,500		$76,500
21	OVERHEAD & PROFIT					$2,170,700		$2,170,700
22	PAYRL BRD.&BENFT.				$4,654,800			$4,654,800
	INDIRECT FIELD COSTS				$6,346,200	$9,415,015	$7,535,000	$23,296,215
	DIRECT & INDIRECT FIELD COSTS				$13,606,288	$9,715,015	$7,622,940	$30,944,215
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR					$4,855,000		$4,855,000
26	PROJ.MGMT-FERMCO				$1,856,700			$1,856,700
27	CONSTR MGMT-FERMCO				$2,166,100			$2,166,100
	FERMCO FIELD SUPPORT COSTS							$8,877,800
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$5,260,500
	ENGINEERING COSTS							$5,260,500
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$7,622,940	$457,400
	SUB-TOTAL (BASE ESTIMATE)							$45,539,915
32								
33	ESCALATION							
34	RISK BUDGET	25.0%						$11,384,979
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$56,924,894
	CONTINGENCY	14.0%						$6,375,588
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$63,300,482
37								

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- WASTE PIT EXCAVATION
LOCATION- FERNALD, OHIO
PROJ.CTL.- RMF10
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BUDGET ESTIMATE DETAILS 5 YEARS

CONTR.NO.- 4424321
EST. NO. C1-93-9-7

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION LABOR												
	OPERATING ENGINEERS 8 EA X 5 YRS X 1813 HRS =	72520	HR	1	72,520	19.49				$1,413,415			$1,413,415
	TEAMSTERS 5 EA X 5 YRS X1813 HRS =	45400	HR	1	45,400	16.69				$757,726			$757,726
	LABORS 6 EA X 5YRS X 1813 =	54390	HR	1	54,390	16.40				$891,996			$891,996
	MASTER MECHANICS 2 EA X 5 YRS X 1813 =	18130	HR	1	18,130	21.49				$389,614			$389,614
	CONTAMINATED WORK AREA				190,440					$3,452,751			$3,452,751
	LABOR FACTOR @ ADD OF 1.1 X TOTAL LABOR =				209,484					$3,798,026			$3,798,026
	TOTAL				399,924					$7,250,776			$7,250,776
	ASPHALT ROADS, RAMPS AND CURBS												
	6000 LF ROAD X 20' WIDE BASE	13,500	SY	0.013	176	16.51			5.25	$2,906		$70,875	$73,781
	8' SUB BASE, 2" CRUSHED COURSE, WITH 4" ASPHAL	1,350	SY	0.021	28	16.51			5.90	$462		$7,965	$8,427
	CURB	10,000	LF	0.036	360	16.51			0.91	$5,944		$9,100	$15,044
	TOTAL (ROADS)	24,850	SY		564					$9,312		$87,940	$97,252
	TOTAL EXCAVATION & CIVIL				400488					$7,260,088		$87,940	$7,348,028
	SUITE UPS 50,000 MAN DAYS @ 50% =	25000	EA						250			$6,250,000	$6,250,000
	TOTAL HEALTH & PHYSICS											$6,250,000	$6,250,000

000033

CONTR.NO.– [redacted]321
CLIENT– U.S. [redacted]. OF ENERGY
PROJECT– WASTE PIT EXCAVATION
LOCATION– FERNALD, OHIO
PROJ.CTL.– RMF10
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BUDGET ESTIMATE DETAILS 5 YEARS

CONTR.NO. [redacted]424321
EST. NO. C1–93–9–7

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS			COST/UNIT			LABOR	SUB CONTRACT	MATERIAL	TOTAL
				UNIT	TOTAL	RATE	LABOR	SUB	MAT'L				
	SPRUNG STRUCTURE 100' X 200'EQUIPMENT SERVIC INC CONCRETE SLAB	20000	SF					15			$300,000		$300,000
													$300,000
	TOTAL BUILDINGS												$300,000

000034

6092

CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- WASTE PIT EXCAVATION
LOCATION- FERNALD, OHIO
PROJ.CTL.- RMF10
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BUDGET ESTIMATE DETAILS 5 YEARS

CONTR.NO.- 4424321
EST. NO. C1-93-9-7

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL												
	CAT 245D SHOVEL	60	MO					20085			$1,205,100		$1,205,100
	OPERATING COSTS	9065	HR					47			$426,055		$426,055
	CAT 973D LOADER	60	MO					9175			$550,500		$550,500
	OPERATING COSTS	4500	HR					22			$99,000		$99,000
	CASE 780B	60	MO					4070			$244,200		$244,200
	OPERATING COSTS	3000	HR					12			$36,000		$36,000
	CAT 14G GRADER	60	MO					8310			$498,600		$498,600
	OPERATING COSTS	4200	HR					19			$79,800		$79,800
	CAT 980F LOADER	60	MO					10500			$630,000		$630,000
	OPERATING COSTS	3000	HR					30			$90,000		$90,000
	DYNAPAC COMPACTOR	60	MO					6460			$387,600		$387,600
	OPERATING COSTS	4200	HR					10			$42,000		$42,000
	CAT AP 1100 ASPHALT PAVER	24	MO					9505			$228,120		$228,120
	OPERATING COSTS	4200	HR					18			$75,600		$75,600
	PU TRUCKS	240	MO					450			$108,000		$108,000
	OPERATING COSTS	3600	HR					2			$7,200		$7,200
	WELD TRUCK	60	MO					1500			$90,000		$90,000
	OPERATING COSTS	3000	HR					5			$15,000		$15,000
	WATER TRUCK 5000 GAL	60	MO					3450			$207,000		$207,000
	OPERATING COSTS	3000	HR					13			$39,000		$39,000
	OFF ROAD DUMP TRUCK CAT 25D	120	MO					5890			$706,800		$706,800
	OPERATING COSTS	18000	HR					14			$252,000		$252,000
	FUEL LUBE TRUCK	60	MO					1500			$90,000		$90,000
	FLAT BED TRUCK W/HYD CRANE	60	MO					1500			$90,000		$90,000
	OPERATING COSTS	3000	HR					14			$42,000		$42,000
	SAMPLING DRILL RIG	60	MO					5000			$300,000		$300,000
	OPERATING COSTS	3000	HR					15			$45,000		$45,000
	PIT HOG DREDGE	30	MO					5200			$156,000		$156,000
	OPERATING COSTS	4530	HR					28			$126,840		$126,840
	TOTAL EQUIPMENT RENTAL	39509									$6,867,415		$6,867,415

000035

CONTR.NO.– [redacted]321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– WASTE PIT EXCAVATION
LOCATION– FERNALD, OHIO
PROJ.CTL.– RMF10
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BUDGET ESTIMATE DETAILS 5 YEARS

CONTR.NO.– 4424321
EST. NO. C1–93–9–7

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SUMMARY – LAB – TESTS												
	TOTAL METALS	1000	EA					207			$207,000		$207,000
	FULL RAD	1000	EA					3101			$3,101,000		$3,101,000
	SEMI VOLATILE ORGANICS	1000	EA					841			$841,000		$841,000
	VOLATILE ORGANICS	1000	EA					415			$415,000		$415,000
	PESTICIDES/PCB'S/DIOXINS	1000	EA					291			$291,000		$291,000
	TOTAL SOIL/WATER/AIR										$4,855,000		$4,855,000

000036

6097

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: WASTE PIT EXCAVATION (10 YEARS)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7-A
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Waste would be removed from the waste pits using both dry and wet excavation methods. Removal rates would be directly related to the treatment through-put rates (i.e. maximum production capacity of the waste treatment facility). Labor and equipment hours for pit excavation are based on the daily capacity of the vitrification equipment. Excavation equipment is sized to accommodate the expected field conditions and the physical nature of the waste material. This cost component is applicable to Alternative 4A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- The total estimated quantity of material that would be removed from the waste pit area is estimated at 1,004,300 dry tons (approximately 710,000 cubic yards). This includes 893,800 dry tons of waste, cap material, and liner, and an additional 110,500 dry tons of residual surface and subsurface soil.

- Waste removal would be planned to match the treatment processing rates to avoid the need to stockpile and double handle the removed materials. An estimated 10 years would be required for waste removal operations.

- The labor hours for waste excavation activities associated with this cost component, based on operating in Level D conditions, was estimated at 380,880 labor hours. Since the majority of the personnel associated with waste excavation activities would be required to work in Level B conditions, this quantity was multiplied by a productivity factor of 2.1 to yield 799,848 total labor hours, or the effort required to execute the same activities in Level B conditions.

- Approximately 6,000 linear feet (LF) of 20-foot wide asphalt-paved roadways would be installed connecting the waste pit area with the pretreatment facility. The roadways would be lined with four-inch berms to control the flow of water generated during daily washdown operations.

BUILDINGS

- A 20,000 SF SPRUNG® structure placed on a concrete slab would be constructed to provide an enclosed area for equipment storage and maintenance.

EQUIPMENT RENTAL

- Excavation and transport of dry pit wastes, caps, liners, and subsurface soils would be accomplished with standard earth moving equipment. Equipment operating in the waste pits would be equipped with enclosed cabs with supplied breathing air.

- Wet pit wastes would be removed with the existing Pit Hog dredge.

HEALTH PHYSICS

- For cost estimating purposes, Level B personal protective equipment would be required for an estimated 50,000 man days.

SOIL/WATER/AIR

- Confirmatory sampling would be performed within 50-foot by 50-foot grids covering the entire surface area of the operable unit. For costing purposes, it is assumed that 50 percent of the grids sampled would fail initial testing relative to established action levels and one round of additional sampling and analyses would be required. Assuming a total surface area of approximately 37.7 acres (1,642,218 square feet (SF)), approximately 1000 samples would be collected and submitted for analyses, which would include metals, volatile and semi-volatile organic compounds, pesticides, PCBs, dioxins, and radiological constituents.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

- Excavation activities associated with Alternatives 4B, 5A, and 5B would be conducted over a five year period where the same activities would be conducted over a 10 year period for Alternative 4A. Since equipment, labor, and escalation costs are based on the

duration of the activity, the total cost identified with waste pit excavation for Alternatives 4B, 5A, and 5B is therefore less than that identified with Alternative 4A.

- Given that excavation equipment is sized primarily to accommodate the expected field conditions and physical nature of the waste encountered during excavation, capacities and quantities for identified pieces of equipment are identical for both the five and ten year waste excavation efforts. However, since the duration of the efforts and the excavation rates differ among the efforts (as dictated by the treatment process), the equipment rental term and operating hours associated with each identified piece of equipment is not identical for both efforts. Additionally, since the identified core labor force is primarily based upon the quantity of equipment required to perform the excavation activities and that the equipment requirements are the same for both efforts, the labor force would essentially remain constant for both efforts.

FERMCO ESTIMATING SERVICES

EST FILE #: C1-93-9-7-A

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: WASTE PIT EXCAVATION (10 YEARS)

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	609,732		$11,137,288		$87,940	$11,225,20[illegible]
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS				$300,000		$300,00[illegible]
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		609,732		$11,137,288	$300,000	$87,940	$11,525,2[illegible]
11	SUPERVISION - CONTRACTOR				$2,467,000			$2,467,000
12	SM TOOLS/CONSM'BLS						$668,200	$668,200
13	EQUIPMENT RENTAL					$13,070,566		$13,070,56[illegible]
14	TEMP. FACILITIES				$233,900		$434,400	$668,300
15	TEMP UTL'S HOOK-UP				$116,900		$217,200	$334,100
16	JOB CLEAN-UP				$233,900		$434,400	$668,300
17	SAFETY				$116,900		$217,200	$334,100
[illegible]	EALTH PHYSICS						$12,500,000	$12,500,00[illegible]
[illegible]	ERCLA	$1,500 PER PERSON				$457,300		$457,300
20	BOND					$115,300		$115,300
21	OVERHEAD & PROFIT					$3,852,800		$3,852,800
22	PAYRL BRD.&BENFT.				$7,439,100			$7,439,100
	INDIRECT FIELD COSTS				$10,607,700	$17,495,966	$14,471,400	$42,575,06[illegible]
	DIRECT & INDIRECT FIELD COSTS				$21,744,988	$17,795,966	$14,559,340	$54,100,26[illegible]
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR					$4,855,000		$4,855,000
26	PROJ.MGMT-FERMCO				$3,246,000			$3,246,000
27	CONSTR MGMT-FERMCO				$3,787,000			$3,787,000
	FERMCO FIELD SUPPORT COSTS							$11,888,00[illegible]
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$9,197,000
	ENGINEERING COSTS							$9,197,00[illegible]
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$14,559,340	$873,600
	SUB-TOTAL (BASE ESTIMATE)							$76,058,86[illegible]
32								
33	ESCALATION							
34	RISK BUDGET	25.0%						$19,014,71[illegible]
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$95,073,58[illegible]
	[illegible]NTINGENCY	14.0%						$10,648,24[illegible]
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$105,721,82[illegible]
37								

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CONTR.NO.– 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– WASTE PIT EXCAVATION VITRIFICATION
LOCATION– FERNALD, OHIO
PROJ.CTL.– RMF10
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10 YEAR PROGRAM FOR VIT

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1–93–9–7A

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION LABOR												
	OPERATING ENGINEERS 6 EA X 10YRS X 1813 HRS =	108780	HR	1	108,780	19.49				$2,120,122			$2,120,122
	TEAMSTERS 4 EA X 10 YRS X1813 HRS =	72520	HR	1	72,520	16.69				$1,210,359			$1,210,359
	LABORS 4 EA X 10 YRS X 1813 =	72520	HR	1	72,520	16.40				$1,189,328			$1,189,328
	MASTER MECHANICS 2 EA X 10 YRS X 1813 =	36260	HR	1	36,260	21.49				$779,227			$779,227
	CONTAMINATED WORK AREA				290,080					$5,299,036			$5,299,036
	LABOR FACTOR @ ADD OF 1.1 X TOTAL LABOR =				319,088					$5,828,940			$5,828,940
	TOTAL 10 YEARS EXCA OPERATION				609,168					$11,127,976			$11,127,976
	ASPHALT ROADS, RAMPS AND CURBS												
	6000 LF ROAD X 20' WIDE BASE	13,500	SY	0.013	176	16.51			5.25	$2,906		$70,875	$73,781
	8' SUB BASE, 2" CRUSHED COURSE, WITH 4" ASPHAL	1,350	SY	0.021	28	16.51			5.90	$462		$7,965	$8,427
	CURB	10,000	LF	0.036	360	16.51			0.91	$5,944		$9,100	$15,044
	TOTAL (ROADS)	24,850	SY		564					$9,312		$87,940	$97,252
	TOTAL EXCAVATION & CIVIL				609,732					$11,137,288		$87,940	$11,225,228
	SUITE UPS 100,000 MAN DAYS @ 50% =	50000	EA						250			$12,500,000	$12,500,000
	TOTAL HEALTH & PHYSICS												

000041

CONTR.NO.– [illegible]321
CLIENT– U.S. [illegible]. OF ENERGY
PROJECT– WASTE PIT EXCAVATION VITRIFICATION
LOCATION– FERNALD, OHIO
PROJ.CTL.– RMF10
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10 YEAR PROGRAM FOR VIT

BUDGET ESTIMATE DETAILS

CONTR.NO. [illegible]24321
EST. NO. CT-93-9-7A

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL												
	CAT 245D SHOVEL	120	MO					20085			$2,410,200		$2,410,200
	OPERATING COSTS	13598	HR					47			$639,106		$639,106
	CAT 973D LOADER	120	MO					9175			$1,101,000		$1,101,000
	OPERATING COSTS	6750	HR					22			$148,500		$148,500
	CASE 780B	120	MO					4070			$488,400		$488,400
	OPERATING COSTS	4500	HR					12			$54,000		$54,000
	CAT 14G GRADER	120	MO					8310			$997,200		$997,200
	OPERATING COSTS	6300	HR					19			$119,700		$119,700
	CAT 980F LOADER	120	MO					10500			$1,260,000		$1,260,000
	OPERATING COSTS	4500	HR					30			$135,000		$135,000
	DYNAPAC COMPACTOR	120	MO					6460			$775,200		$775,200
	OPERATING COSTS	6300	HR					10			$63,000		$63,000
	CAT AP 1100 ASPHALT PAVER	36	MO					9505			$342,180		$342,180
	OPERATING COSTS	6300	HR					18			$113,400		$113,400
	PU TRUCKS 4 EA	480	MO					450			$216,000		$216,000
	OPERATING COSTS	7200	HR					2			$14,400		$14,400
	WELD TRUCK	120	MO					1500			$180,000		$180,000
	OPERATING COSTS	6000	HR					5			$30,000		$30,000
	WATER TRUCK 5000 GAL	120	MO					3450			$414,000		$414,000
	OPERATING COSTS	6000	HR					13			$78,000		$78,000
	OFF ROAD DUMP TRUCK CAT 25D	240	MO					5890			$1,413,600		$1,413,600
	OPERATING COSTS	27000	HR					14			$378,000		$378,000
	FUEL LUBE TRUCK	120	MO					1500			$180,000		$180,000
	FLAT BED TRUCK W/HYD CRANE	120	MO					1500			$180,000		$180,000
	OPERATING COSTS	6000	HR					14			$84,000		$84,000
	SAMPLING DRILL RIG	120	MO					5000			$600,000		$600,000
	OPERATING COSTS	6000	HR					15			$90,000		$90,000
	PIT HOG DREDGE	60	MO					5200			$312,000		$312,000
	OPERATING COSTS	9060	HR					28			$253,680		$253,680
	TOTAL EQUIPMENT RENTAL	62924									$13,070,566		$13,070,566

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- WASTE PIT EXCAVATION VITRIFICATION
LOCATION- FERNALD, OHIO
PROJ.CTL.- RMF10
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10 YEAR PROGRAM FOR VIT

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-7A

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS			COST/UNIT			LABOR	SUB CONTRACT	MATERIAL	TOTAL
				UNIT	TOTAL	RATE	LABOR	SUB	MAT'L				
	SPRUNG STRUCTURE 100' X 200'EQUIPMENT SERVIC INC CONCRETE SLAB	20000	SF					15			$300,000		$300,000
	TOTAL BUILDING												$300,000

000043

CONTR.NO.- [redacted]21
CLIENT- U.S. D[redacted]. OF ENERGY
PROJECT- WASTE PIT EXCAVATION VITRIFICATION
LOCATION- FERNALD, OHIO
PROJ.CTL.- RMF10
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10 YEAR PROGRA[redacted]R VIT

BUDGET ESTIMATE DETAILS

CONTR.NO.-[redacted]24321
EST. NO. CT-93-9-7A

DATE: 02/17/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SUMMARY - LAB - TESTS												
	TOTAL METALS	1000	EA					207			$207,000		$207,000
	FULL RAD	1000	EA					3101			$3,101,000		$3,101,000
	SEMI VOLATILE ORGANICS	1000	EA					841			$841,000		$841,000
	VOLATILE ORGANICS	1000	EA					415			$415,000		$415,000
	PESTICIDES/PCB'S/DIOXINS	1000	EA					291			$291,000		$291,000
	TOTAL SOIL/ WATER/ AIR										$4,855,000		$4,855,000

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6097

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: WASTE PIT BACKFILL (5 YEARS)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7-2
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Restoration of the Waste Pit Area, which would include backfilling the excavated waste pits and construction of a multi-layered cover, would be sequenced with the removal of waste materials. As a basis for this estimate clean backfill would be used during all waste pit backfilling operations. Backfill soils would be obtained from a potential borrow area located immediately north of the railroad tracks on the north side of the Waste Pit Area. Backfill material suitability and placement would be controlled to ensure a satisfactory subgrade for cover construction. The construction of the cover system would be planned to sequentially follow the placement of backfill material. This cost component is applicable to Alternatives 4B, 5A, and 5B. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Approximately 140,000 square yards (SYs) of vegetated area would require clearing and grubbing at the borrow pit. An estimated 35,000 cubic yards (CYs) of removed topsoil would be stockpiled for future restoration.

- An estimated 480,000 CYs of material would be excavated from the borrow pit and hauled a distance of approximately 2,300 feet for placement within the Waste Pit Area.

- Upon completion of waste pit backfilling operations, a 6.3-foot thick multi-layer cover would be constructed over the Waste Pit Area encompassing approximately 24 acres. The cover would incorporate (ascending from bottom to top) a low permeability soil barrier, a geomembrane and geosynthetic clay liner, a high-permeability drain layer, a vegetative layer of clean soil and topsoil.

- Approximately 140,000 CYs of select, high clay content soil would be obtained from a local vendor for placement within the multi-layer cover system.

- The final vegetative cover would be seeded with fast growing grasses.

EQUIPMENT RENTAL

- Excavation, transport, and placement of backfill would be accomplished using standard earth moving equipment. Construction of the multi-layer cover system would also be accomplished using standard earth moving equipment.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on historical cost data for similar activities and the estimator's experience. Labor rates are based on current contract and/or FERMCO labor rates for executing similar activities.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

- Waste Pit Area backfill activities associated with Alternatives 4B, 5A, and 5B would be conducted over a five year period (for cost estimating purposes) where the same activities would be conducted over a 10 year period (for estimating purposes) for Alternative 4A. Since equipment, labor, and escalation costs are based on the duration of the activity, the total cost identified with backfilling for Alternatives 4B, 5A, and 5B is therefore less than that identified with Alternative 4A.

- The cost estimate associated with this cost component assumes that much of the material required to backfill the waste pits and construct the multi-layer cover will be obtained from a potential borrow area immediately north of the railroad tracks on the north side of the Waste Pit Area. Should this area be unavailable for development or provide inadequate quantities of required materials, an off-site borrow source may have to be used. If so, the cost associated with this cost component may increase.

EST FILE #: C1-93-9-7-2

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: WASTE PIT BACKFILL (5 YEARS)

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	73,460		$1,345,000		$269,500	$1,614,500
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		73,460		$1,345,000		$269,500	$1,614,500
11	SUPERVISION - CONTRACTOR				$229,000			$229,000
12	SM TOOLS/CONSM'BLS						$80,700	$80,700
13	EQUIPMENT RENTAL					$3,072,280		$3,072,280
14	TEMP. FACILITIES				$28,200		$52,500	$80,700
15	TEMP UTL'S HOOK-UP				$14,100		$26,200	$40,300
16	JOB CLEAN-UP				$28,200		$52,500	$80,700
17	SAFETY				$14,100		$26,200	$40,300
18	HEALTH PHYSICS				$331,700			$331,700
19	CERCLA	$1,500 PER PERSON				$55,100		$55,100
20	BOND					$16,100		$16,100
21	OVERHEAD & PROFIT					$507,700		$507,700
22	PAYRL BRD.&BENFT.				$1,035,000			$1,035,000
	INDIRECT FIELD COSTS				$1,680,300	$3,651,180	$238,100	$5,569,580
	DIRECT & INDIRECT FIELD COSTS				$3,025,300	$3,651,180	$507,600	$7,184,080
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$5,700		$10,500	$16,200
26	PROJ.MGMT-FERMCO				$431,000			$431,000
27	CONSTR MGMT-FERMCO				$502,900			$502,900
	FERMCO FIELD SUPPORT COSTS							$950,100
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$1,221,300
	ENGINEERING COSTS							$1,221,300
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$518,100	$31,100
	SUB-TOTAL (BASE ESTIMATE)							$9,386,580
32								
33	ESCALATION							
34	RISK BUDGET	20.0%						$1,877,316
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$11,263,896
35	CONTINGENCY	12.0%						$1,126,390
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$12,390,286
37								

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CONTR.NO.- [redacted]321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- WASTE PIT BACKFILL
LOCATION- FERNALD, OHIO
PROJ.CTL.-
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BUDGET ESTIMATE DETAILS

CONTR.NO. [redacted]4424321
EST. NO. C1-93-9-7-2
DATE: 02/14/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	GENERAL SITE WORK												
	SITE DEMOLITION												
	CLEAR AND GRUB BORROW PIT	140000	SY	0.003	420	19.59				$8,228			$8,228
	STRIP TOPSOIL & STORE	35000	CY	0.003	105	19.59				$2,057			$2,057
	EXCAVATE & LOAD BACKFILL	480000	CY	0.067	32,160	19.59				$630,014			$630,014
	EXCAVATE CLAY CAP MATERIAL	140000	CY	0.067	9,380	16.69				$156,552			$156,552
	HAUL FILL 2300'	480000	CY	0.020	9,600	16.69				$160,224			$160,224
	SPREAD FILL MATERAL	480000	CY	0.009	4,320	19.59				$84,629			$84,629
	COMPACT FILL	210000	SY	0.003	630	19.59				$12,342			$12,342
	COMPACT CLAY CAP	280000	SY	0.003	840	19.59				$16,456			$16,456
	GEOTECHANICAL FILTER MEMBRANE	210000	SY	0.050	10,500	16.51			$1.25	$173,355		$262,500	$435,855
	TOP SOIL PLACEMENT @ 8" THICK	210000	SY	0.009	1,890	19.59				$37,025			$37,025
	HYDROSEEDING	210	MSF	0.500	105	16.51			$20	$1,734		$4,200	$5,934
	EQUIPMENT DEMOB												
	5 MEN X 400 HRS	2000	HR		2,000	16.51				$33,020			$33,020
	BORROW PIT RESTORATION												
	CONTOUR GRADING SPREAD TOP SOIL	160000	SY	0.009	1,440	19.59				$28,210			$28,210
	HYDROSEEDING	140	MSF	0.500	70	16.51			$20	$1,156		$2,800	$3,956
	TOTAL EXCAVATION & CIVIL				73460					$1,345,000		$269,500	$1,614,500

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2609

CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- WASTE PIT BACKFILL
LOCATION- FERNALD, OHIO
PROJ.CTL.-
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BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-7-2

DATE: 02/14/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	BORROW PIT & BACK FILL EQUIPMENT												
	CAT 973-D	36	MO					9175			$330,300		$330,300
	OPERATION COST	6000	HR					22			$132,000		$132,000
	CAT D10N	36	MO					27360			$984,960		$984,960
	OPERATION COST	6000	HR					70			$420,000		$420,000
	CAT D25D DUMP TRUCK	72	M0					5890			$424,080		$424,080
	OPERATION COST	12000	HR					14			$168,000		$168,000
	SHEEP FOOT COMPACTOR	12	MO					12005			$144,060		$144,060
	CAT 436B BACKHOE	36	M0					4070			$146,520		$146,520
	OPERATION COST	7200	HR					12			$86,400		$86,400
	CAT 14G GRADER	12	MO					8310			$99,720		$99,720
	OPERATION COST	1000	HR					19			$19,000		$19,000
	FUEL LUBE TRUCK	36	MO					1500			$54,000		$54,000
	PICK UP TRUCKS 3/4 TON	108	MO					530			$57,240		$57,240
	OPERATION COST	3000	HR					2			$6,000		$6,000
	TOTAL EQUIPMENT RENTAL										$3,072,280		$3,072,280

000039

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: WASTE PIT BACKFILL (10 YEARS)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7-2-A
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Restoration of the Waste Pit Area, which would include backfilling the excavated waste pits and construction of a multi-layered cover, would be sequenced with the removal of waste materials. Clean backfill would be used during all waste pit backfilling operations. Backfill soils would be obtained from a potential borrow area located immediately north of the railroad tracks on the north side of the Waste Pit Area. Backfill material suitability and placement would be controlled to ensure a satisfactory subgrade for cover construction. The construction of the cover system would be planned to sequentially follow the placement of backfill material. This cost component is applicable to Alternative 4A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Approximately 140,000 square yards (SYs) of vegetated area would require clearing and grubbing at the borrow pit. An estimated 35,000 cubic yards (CYs) of removed topsoil would be stockpiled for future restoration.

- An estimated 480,000 CYs of material would be excavated from the borrow pit and hauled a distance of approximately 2,300 feet for placement within the Waste Pit Area.

- Upon completion of waste pit backfilling operations, a 6.3-foot thick multi-layer cover would be constructed over the Waste Pit Area encompassing approximately 24 acres. The cover would incorporate (ascending from bottom to top) a low permeability soil barrier, a geomembrane and geosynthetic clay liner, a high-permeability drain layer, a vegetative layer of clean soil and topsoil.

- Approximately 140,000 CYs of select, high clay content soil would be obtained from a local vendor for placement within the multi-layer cover system.

- The final vegetative cover would be seeded with fast growing grasses.

EQUIPMENT RENTAL

- Excavation, transport, and placement of backfill would be accomplished using standard earth moving equipment. Construction of the multi-layer cover system would also be accomplished using standard earth moving equipment.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on historical cost data for similar activities and the estimator's experience. Labor rates are based on current contract and/or FERMCO labor rates for executing similar activities.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

- Waste Pit Area backfill activities associated with Alternatives 4B, 5A, and 5B would be conducted over a five year period (for cost estimating purposes) where the same activities would be conducted over a 10 year period (for estimating purposes) for Alternative 4A. Since equipment, labor, and escalation costs are based on the duration of the activity, the total cost identified with backfilling for Alternatives 4B, 5A, and 5B is therefore less than that identified with Alternative 4A.

- The cost estimate associated with this cost component assumes that much of the material required to backfill the waste pits and construct the multi-layer cover will be obtained from a potential borrow area immediately north of the railroad tracks on the north side of the Waste Pit Area. Should this area be unavailable for development or provide inadequate quantities of required materials, an off-site borrow source may have to be used. If so, the cost associated with this cost component may increase.

EST FILE #: C1-93-9-7-2A

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: WASTE PIT BACKFILL (10 YEARS)

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	133,460		$2,552,748		$269,500	$2,822,200
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		133,460		$2,552,748		$269,500	$2,822,200
11	SUPERVISION - CONTRACTOR				$410,000			$410,000
12	SM TOOLS/CONSM'BLS						$153,200	$153,200
13	EQUIPMENT RENTAL					$5,731,860		$5,731,860
14	TEMP. FACILITIES				$53,600		$99,600	$153,200
15	TEMP UTL'S HOOK-UP				$26,800		$49,800	$76,600
16	JOB CLEAN-UP				$53,600		$99,600	$153,200
17	SAFETY				$26,800		$49,800	$76,600
	HEALTH PHYSICS				$624,700			$624,700
	CERCLA	$1,500 PER PERSON				$100,100		$100,100
20	BOND					$28,200		$28,200
21	OVERHEAD & PROFIT					$929,700		$929,700
22	PAYRL BRD.&BENFT.				$1,949,100			$1,949,100
	INDIRECT FIELD COSTS				$3,144,600	$6,789,860	$452,000	$10,386,460
	DIRECT & INDIRECT FIELD COSTS				$5,697,348	$6,789,860	$721,500	$13,208,660
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$9,900		$18,300	$28,200
26	PROJ.MGMT-FERMCO				$792,500			$792,500
27	CONSTR MGMT-FERMCO				$924,600			$924,600
	FERMCO FIELD SUPPORT COSTS							$1,745,300
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$2,245,500
	ENGINEERING COSTS							$2,245,500
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$739,800	$44,400
	SUB-TOTAL (BASE ESTIMATE)							$17,243,860
32								
33	ESCALATION							
34	RISK BUDGET	20.0%						$3,448,772
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$20,692,632
	CONTINGENCY	12.0%						$2,069,263
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$22,761,895
37								

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CONTR.NO.– 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECTWASTE PIT BACKFILL 10 YEARS
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1–93–9–7–2–A

DATE: 02/17/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	GENERAL SITE WORK												
	SITE DEMOLITION												
	CLEAR AND GRUB BORROW PIT	140000	SY	0.003	420	19.59				$8,228			$8,228
	STRIP TOPSOIL & STORE	35000	CY	0.003	105	19.59				$2,057			$2,057
	EXCAVATE & LOAD BACKFILL	480000	CY	0.067	32,160	19.59				$630,014			$630,014
	EXCAVATE CLAY CAP MATERIAL	140000	CY	0.067	9,380	16.69				$156,552			$156,552
	HAUL FILL 2300'	480000	CY	0.020	9,600	16.69				$160,224			$160,224
	SPREAD FILL MATERAL	480000	CY	0.009	4,320	19.59				$84,629			$84,629
	COMPACT FILL	210000	SY	0.003	630	19.59				$12,342			$12,342
	COMPACT CLAY CAP	280000	SY	0.003	840	19.59				$16,456			$16,456
	GEOTECHNICAL FILTER MEMBRANE	210000	SY	0.050	10,500	19.59			1.25	$205,695		$262,500	$468,195
	TOP SOIL PLACEMENT @ 8" THICK	210000	SY	0.009	1,890	19.59				$37,025			$37,025
	HYDROSEEDING	210	MSF	0.500	105	16.51			$20	$1,734		$4,200	$5,934
	EQUIPMENT DEMOB 5 MEN X 400 HRS	2000	HR		2,000	16.51				$33,020			$33,020
	BORROW PIT RESTORATION												
	CONTOUR GRADING SPREAD TOP SOIL	160000	SY	0.009	1,440	19.59				$28,210			$28,210
	HYDROSEEDING	140	MSF	0.500	70	16.51			$20	$1,156		$2,800	$3,956
	ADDITIONAL LABOR REQUIRED FOR ADDED DURATION OF VITRIFICATION TREATMENT 10 MEN X 3 YEARS	60000	HR	1	60,000	19.59				$1,175,400			$1,175,400
	TOTAL EXCAVATION & CIVIL				133,460					$2,552,740		$269,500	$2,822,240

000053

CONTR.NO.- 24321
CLIENT- U.S. DEPT. OF ENERGY
PROJECTWASTE PIT BACKFILL 10 YEARS
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-7-2-A

DATE: 02/17/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	BORROW PIT & BACK FILL EQUIPMENT												
	CAT 973-D	72	MO					9175			$660,600		$660,600
	OPERATION COST	9000	HR					22			$198,000		$198,000
	CAT D10N	72	MO					27360			$1,969,920		$1,969,920
	OPERATION COST	9000	HR					70			$630,000		$630,000
	CAT D25D DUMP TRUCK	144	MO					5890			$848,160		$848,160
	OPERATION COST	18000	HR					14			$252,000		$252,000
	SHEEP FOOT COMPACTOR	24	MO					12005			$288,120		$288,120
	CAT 436B BACKHOE	72	MO					4070			$293,040		$293,040
	OPERATION COST	10800	HR					12			$129,600		$129,600
	CAT 14G GRADER	24	MO					8310			$199,440		$199,440
	OPERATION COST	1500	HR					19			$28,500		$28,500
	FUEL LUBE TRUCK	72	MO					1500			$108,000		$108,000
	PICK UP TRUCKS 3/4 TON	216	MO					530			$114,480		$114,480
	OPERATION COST	6000	HR					2			$12,000		$12,000
	TOTAL EQUIPMENT RENTAL										$5,731,860		$5,731,860

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: PRETREATMENT FACILITY
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7-4
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

The pretreatment facility would be used to provide support services to the remediation effort and to enclose the initial waste processing operation and equipment. This cost component is applicable to all alternatives. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Approximately 25,000 square yards (SYs) of surface area would require clearing and grubbing. An estimated 12,800 cubic yards (CYs) of material would need to be excavated from the pretreatment facility site.

- A 44,000 square foot building with a height of 25 feet would be constructed to house equipment identified for pretreating the waste materials. The pretreatment facility would be separated into a truck shop and wash area, warehouse, and enclosed stockpile area. The enclosed stockpile area would be sized to accommodate storage capacity for 15,000 tons of excavated waste material and the crusher-shredder equipment. Epoxy coated concrete floors within the stockpile area would be sloped to drain free liquids released from the waste. This portion of the building would also be negatively ventilated with air exhausted through ducts and directed to high efficiency particulate air (HEPA) filters. The facility would be connected to existing potable water, stormwater, and electrical services.

CONCRETE

- Approximately 4,691 CYs of structural grout would be required for building foundations and equipment footings. An estimated 400 tons of steel would be required for reinforcement.

STRUCTURAL STEEL

- The pretreatment facility would be constructed of an estimated 380 tons of structural steel frames and roof trusses, 21,000 square feet (SF) of insulated metal sidewalls, and 44,000 SF of insulated roof panels.

ELECTRICAL

- All electrical services required to support the operations contained within the pretreatment facility would be installed.

EQUIPMENT RENTAL

- Excavation and construction activities would be accomplished with conventional equipment.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-7-4

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: PRETREATMENT FACILITY

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	13,606		$229,672			$229,700
2		CONCRETE	18,610		$326,783		$650,978	$977,800
3		STRUCTURAL STEEL	51,144		$971,716		$2,023,850	$2,995,600
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL	6,692		$121,069		$220,000	$341,100
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**90,052**		**$1,649,240**		**$2,894,828**	**$4,544,200**
11	SUPERVISION - CONTRACTOR				$280,400			$280,400
12	SM TOOLS/CONSM'BLS						$99,000	$99,000
13	EQUIPMENT RENTAL						$315,200	$315,200
14	TEMP. FACILITIES				$34,600		$64,300	$98,900
15	TEMP UTL'S HOOK-UP				$17,300		$32,200	$49,500
16	JOB CLEAN-UP				$34,600		$64,300	$98,900
17	SAFETY				$17,300		$32,200	$49,500
18	HEALTH PHYSICS				$406,700			$406,700
19	CERCLA	$1,500 PER PERSON				$67,500		$67,[illegible]
20	BOND					$45,400		$4[illegible]
21	OVERHEAD & PROFIT					$545,000		$545,000
22	PAYRL BRD.&BENFT.				$1,268,900			$1,268,900
	INDIRECT FIELD COSTS				**$2,059,800**	**$657,900**	**$607,200**	**$3,324,900**
	DIRECT & INDIRECT FIELD COSTS				**$3,709,040**	**$657,900**	**$3,502,028**	**$7,869,100**
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$15,900		$29,500	$45,400
26	PROJ.MGMT-FERMCO				$472,100			$472,100
27	CONSTR MGMT-FERMCO				$550,800			$550,800
	FERMCO FIELD SUPPORT COSTS							**$1,068,300**
28								
29								
30	ENGINEERING	**TITLE I**	**TITLE II**		**TITLE III**			$1,337,700
	ENGINEERING COSTS							**$1,337,700**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$3,531,528	$211,900
	SUB-TOTAL (BASE ESTIMATE)							**$10,487,000**
32								
33	ESCALATION							
34	RISK BUDGET	19.0%						$1,992,530
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$12,479,530**
35	CONTINGENCY	11.0%						$1,153,570
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**							**$13,63[illegible]**
37								

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CONTR.NO.- [redacted]4321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS/PP TREATMENT FACILITY
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO. 4424321
EST. NO. C1-93-9-7-

DATE: 02/14/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	GENERAL SITE WORK												
	CLEAR AND GRUB	25000	SY	0.005	125	19.59				$2,449			$2,449
	EXCAVATE BUILDING AREA	12800	CY	0.020	256	19.59				$5,015			$5,015
	240' X 180' X 8 / 27' = COMPACT BUILDING AREA	12800	CY	0.030	384	19.59				$7,523			$7,523
	EXCAVATE & COMPACT RAIL AREA	270	CY	0.050	14	19.59				$274			$274
	EQUIPMENT DECON LABOR	500	HR		500	16.51				$8,255			$8,255
	SUPPORT LABOR	4000	HR		4,000	16.51				$66,040			$66,040
	TOTAL				5279					$89,556			$89,556
	PRODUCTIVITY FACTOR = 2.1				5807					$98,511			$98,511
	SUB TOTAL 1 CIVIL AND EXCAVATION				11086					$188,067			$188,067

000058

6097

CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS/PP TREATMENT FACILITY
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-7-

DATE: 02/14/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MACHINE EXCAVATION W/HAND TRIM												
	EXCAVATION & BACKFILL												
	INDIVIDUAL FOUNDATION EXCAVATION												
	GRADE BEAMS	400	CY	1.000	400	400	16.51			$6,604			
	EQUIPMENT FOUNDATIONS	600	CY	1.000	600	600	16.51			$9,906			$9,906
	CONVEYOR BENT EXCAVATION	200	CY	1.000	200	200	16.51			$3,302			
			CY		1,200					$19,812			$19,812
	PRODUCTIVITY FACTOR 2.1				1320					21793			21793
	SUB TOTAL 2 CIVIL AND EXCAVATION				2,520					$41,605			$41,605

000059

CONTR.NO.- 4[illegible]21
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS/PP TREATMENT FACILITY
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO. [illegible]424321
EST. NO. C1-93-9-7-

DATE: 02/14/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SUMMARY OF EXCAVATION & CIVIL												
	GENERAL SITE WORK				11086					$188,067			$188,067
	(REFER SUBTOTAL 1 EXCAVATION & CIVIL)												
	MACHINE EXCAVATION WITH HAND TRIM				2520					$41,605			$41,605
	(REFER SUBTOTAL 2 EXCAVATION & CIVIL)												
	SUMMARY TOTAL OF EXCAVATION & CIVIL				13,606					$229,672			$229,672

000060

6097

CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS/PP PRETREATMENT FACILITY
LOCATION- FERNALD, OHIO
PROJ.CTL.-
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BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.C19-7-4-E

DATE: 02/14/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	GRADE BEAMS 1200 LF X 3'X 3' =	400	CY	1.000	400		17.56		$58	$7,024		$23,200	$30,224
	FORM WORK	7500	SFCA	0.100	750		17.56		$2	$13,170		$15,000	$28,170
	EQUIPMENT FOUNDATIONS 2200 SF X 5' =	741	CY	1.000	741		17.56		$58	$13,012		$42,978	$55,990
	FORM WORK	4000	SFCA	0.250	1000		17.56		$2	$17,560		$8,000	$25,560
	SLAB ON GRADE	1650	CY	0.250	413		17.56		$58	$7,244		$95,700	$102,944
	SLAB ON GRADE RAIL CAR AREA	200	CY	0.500	100		17.56		$58	$1,756		$11,600	$13,356
	RETAINING WALLS	140	CY	3.000	420		17.56		$58	$7,375		$8,120	$15,495
	FORM WORK	7200	SFCA	0.300	2160		17.56		$2	$37,930		$14,400	$52,330
	CONVEYOR & SILO BENTS 60 EA X 10'=	24	CY	2.000	48		17.56		$58	$843		$1,392	$2,235
	FORM WORK 14" SONO TUBE	600	LF	0.200	120		17.56		$25	$2,107		$15,000	$17,107
	48 COLUMN FOUNDATION	1,536.0	CY	3.000	4,608		17.56		$58	$80,916		$89,088	$170,004
	48*12*12*6												
	REBAR @ 150# PER CY =	400	TON	14	5,600		17.56		$760	$98,336		$304,000	$402,336
	EPOXY COATING	45000	SF	0.050	2,250		17.56		0.50	39510		$22,500	$62,010
	TOTAL (CONCRETE)				18610					$326,783		$650,978	$977,761

000061

CONTR.NO.- [illegible]21
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS/PP PRETREATMENT FACILITY
LOCATION- FERNALD, OHIO
PROJ.CTL.-

BUDGET ESTIMATE DETAILS

CONTR.NO.- [illegible]24321
EST. NO.C19397-4F

DATE: 02/14/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	STRUCTURAL STEEL												
	COLUMNS 24W X 162 X 25' 24 EA	100	TON	40	4,000	19.00			2,200	$76,000		$220,000	$296,000
	LONG SPAN ROOF THRUSSES 180' X 6 EA X 120#	130	TON	80	10,400	19.00			5,400	$197,600		$702,000	$899,600
	STRUCTIAL STEEL GIRTS, WIND BRACE, ETC	150	TON	40	6,000	19.00			2,200	$114,000		$330,000	$444,000
	INSULATED METAL SIDING	21000	SF	0.16	3,360	19.00			5.35	$63,840		$112,350	$176,190
	INSULATED METAL ROOF	44000	SF	0.16	7,040	19.00			5.50	$133,760		$242,000	$375,760
	MAN DOORS	12	EA	12.00	144	19.00			800.00	$2,736		$9,600	$12,336
	HANGER DOOR 20' X 80'	1600	SF	1.20	1,920	19.00			24.00	$36,480		$38,400	$74,880
	UNDER GROUND PIPING/WATER/STORMSEWER/ETC	ALLOW			6,580	19.00				$125,000		$125,000	$250,000
	HEATING & VENTILATING	44000	SF	0.15	6,600	19.00			2.65	$125,400		$116,600	$242,000
	FIRE PROTECTION	44000	SF	0.10	4,400	19.00			2.35	$83,600		$103,400	$187,000
	ROOF DRAINS 8"CPVC INC. FITTINGS 35'X 20 EA =	700	FT	1.00	700	19.00			35.00	$13,300		$24,500	$37,800
	TOTAL (STRUCTURAL STEEL)				51,144					971,716		2,023,850	2,995,566

000062

2609

CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS/PP PRETREATMENT FACILITY
LOCATION- FERNALD, OHIO
PROJ.CTL.-
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BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.C193-9-7-4G

DATE: 02/14/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	ELECTRICAL												
	MAJOR ELECTRICAL FOR BLDG.	44,000	SF	0.152	6692	18.09			$5.00	$121,069		$220,000	$341,069
	SUB TOTAL (ELECTRICAL)		LOT		6,692					$121,069		$220,000	$341,069

000063

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: RAIL SIDING AND SILOS
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7-6
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Construction of additional railroad sidings would be required to facilitate shipment of the treated waste to the off-site disposal facility. Additionally, construction of operational storage silos would be required for bulk loading of the treated waste into gondolas-type railcars for shipment to the disposal facility. This cost component is applicable to Alternative 5B only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- An estimated 5,000 square yards (SYs) would be graded, contoured, and compacted in preparation for railroad track and operational storage silo construction.
- A railcar loading and staging yard consisting of four (4) switches and two (2) 1,000-foot long sidings would be constructed adjacent to the existing railroad siding to the south of OU3.
- A wye consisting of two (2) new switches and 600 feet of track would be constructed at the north end of the existing railroad siding to accommodate train movement.
- Approximately 2,500 cubic yards (CYs) of ballast would be required for construction of the above-identified railroad track.
- A weight scale would be installed to ensure that the loaded railcars do not exceed legal load limits.
- An operational storage facility consisting of five (5) elevated conical steel silos, each with a capacity of 1,000 dry tons and equipped with vibrators and discharge valves, would be constructed to provide for direct railcar loading.
- A mechanized dust control hood for silo discharge/railcar loadout would be installed.

- A 250-foot by 30-foot pre-engineered metal building would be constructed to contain railcar preparation, loadout, and decontamination operations. All applicable utilities (including HVAC, plumbing, and electrical) would be installed.

EQUIPMENT RENTAL

- An allowance, based on the estimators professional judgement, has been provided for the required construction equipment. Standardized equipment would be used for all construction activities.

- One (1) yard locomotive would be used to facilitate railcar movement.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

FERMCO ESTIMATING SERVICES

EST FILE #: C1-93-9-1A

CLIENT: US DOE

PROJECT TITLE: RAIL SIDING AND SILO

SUMMARY SHEET

DATE: 26-Feb-94

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	18,274		$312,882		$918,777	$1,231,700
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		18,274		$312,882		$918,777	$1,231,700
11	SUPERVISION - CONTRACTOR				$53,200			$53,200
12	SM TOOLS/CONSM'BLS						$18,800	$18,800
13	EQUIPMENT RENTAL					$1,536,400		$1,536,400
14	TEMP. FACILITIES				$6,600		$12,200	$18,800
15	TEMP UTL'S HOOK-UP				$3,300		$6,100	$9,400
16	JOB CLEAN-UP				$6,600		$12,200	$18,800
17	SAFETY				$3,300		$6,100	$9,400
18	HEALTH PHYSICS S/C				$77,200			$77,200
	CERCLA	$1,500 PER PERSON				$13,700		$13,700
	BOND					$12,300		$12,300
21	OVERHEAD & PROFIT					$270,000		$270,000
22	PAYRL BRD.&BENFT.				$240,800			$240,800
	INDIRECT FIELD COSTS				$391,000	$1,832,400	$55,400	$2,278,800
	DIRECT & INDIRECT FIELD COSTS				$703,882	$1,832,400	$974,177	$3,510,500
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$4,300		$8,000	$12,300
26	PROJ.MGMT-FERMCO				$210,600			$210,600
27	CONSTR MGMT-FERMCO				$245,700			$245,700
	FERMCO FIELD SUPPORT COSTS							$468,600
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$596,800
	ENGINEERING COSTS							$596,800
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$982,177	$58,900
	SUB-TOTAL (BASE ESTIMATE)							$4,634,800
32								
33	ESCALATION							
34	RISK BUDGET	22.0%						$1,019,656
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$5,654,456
35	CONTINGENCY	13.0%						$602,524
	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$6,256,980
37								

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS RAIL SIDING AND SILOS
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.C193-9-7-6

DATE: 02/17/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	GENERAL SITE WORK												
	SITE DEMOLITION												
	GRADE AND FILL 2200' X 20'	5000	SY	0.050	250	16.51				$4,128			$4,128
	COMPACT FILL	5000	SY	0.030	150	16.51				$2,477			$2,477
	RAIL BALLAST	2500	CY	1.000	2,500	16.51			13	$41,275		$31,250	$72,525
	125 # RAIL	2600	LF	0.500	1,300	16.51			185	$21,463		$481,000	$502,463
	SCALE 150 TON 72' x 10'	1.0	EA		300	19.00			33800	$5,700		$33,800	$39,500
	CONCRETE 80' x 12' x 12'	45.0	CY	7.430	334	16.51			103	$5,514		$4,617	$10,131
	SILOS (5 EA x 1000 TONS) , ALLOWANCE ASSUME 30' DIA x 30' HT EA SILOS	5	EA	840	4200	19			24040	$79,800		$120,200	$200,000
	PAINT	16000	SF	0.02	240	16.40			0.26	$3,936		$4,160	$8,096
	METAL BLDG 250'x30'x25'HT	7,500.0	SF	0.30	2,250	16.51			10.00	$37,148		$75,000	$112,148
	SITE WORK CONCRETE	7500	SF	0.60	4,500	16.51			15.00	$74,295		$112,500	$186,795
	HVAC	7500	SF	0.12	900	16.51			3.00	$14,859		$22,500	$37,359
	PLUMBING	7500	SF	0.06	450	16.51			1.50	$7,430		$11,250	$18,680
	ELECTRICAL	7500	SF	0.12	900	16.51			3.00	$14,859		$22,500	$37,359
	TOTAL WORK (EXCAVATION & CIVIL ON SUMMARY)				18,274					$312,882		$918,777	$1,231,659

000087

CONTR.NO.- 24321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS RAIL SIDING AND SILOS
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.C193-9-7-6

DATE: 02/17/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL												
	YARD LOCOMOTIVE	60	MO					10735			$644,100		$644,100
	YARD LOCOMOTIVE OPERATION	4,000	HR					22			$88,000		$88,000
	ALLOWANCE FOR EQUIPMENT FOR GRADE AND FILL										$95,000		$95,000
	ALLOWANCE FOR COMPACTION EQUIPMENT										$50,050		$50,050
	ALLOWANCE FOR ALLOWANCE FOR CRANE TO ERECT SILOS AND BUILDING										$187,250		$187,250
	RAILROAD CONSTRUCTION EQUIPMENT ALLOWANCE										$472,000		$472,000
	TOTAL EQUIPMENT RENTAL												$1,536,400

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: RAIL SIDING ONLY
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-7-6R
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Construction of additional railroad sidings would be required to facilitate shipment of the processed waste to the Nevada Test Site. Additionally, construction of a storage silo would be required for bulk loading of the processed waste material into approved waste storage containers. The containers would be loaded onto railcars for shipment to Las Vegas, Nevada, where they then be unloaded onto trucks for transfer to the Nevada Test Site. This cost component is applicable to Alternative 5A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- An estimated 5,000 square yards (SYs) would be graded, contoured, and compacted in preparation for railroad track construction.
- A railcar loading and staging yard consisting of four (4) switches and two (2) 1,000-foot long sidings would be constructed adjacent to the existing railroad siding to the south of OU3.
- A wye consisting of two (2) new switches and 600 feet of track would be constructed at the north end of the existing siding to accommodate train movement.
- Approximately 2,500 cubic yards (CYs) of ballast would be required for construction of the above-identified railroad track.
- A 200-foot by 100-foot reinforced concrete slab container storage area would be constructed to provide operational storage for shipping containers.
- Installation of a mechanized dust control hood for silo discharge.
- A 100-foot by 50-foot pre-engineered metal building would be constructed for container preparation and loadout. All applicable utilities (including HVAC, plumbing, and electrical) would be installed.

EQUIPMENT RENTAL

- An allowance, based on the estimators professional judgement, has been provided for the required construction equipment. Standardized equipment would be used for all construction activities.

- One (1) 30-ton capacity forklift and one (1) yard locomotive would be used to facilitate container loading and railcar movement.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-7-6R

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: FS/RAIL SIDING NTS

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	16,006		$265,006		$784,577	$1,049,600
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**16,006**		**$265,006**		**$784,577**	**$1,049,600**
11	SUPERVISION - CONTRACTOR				$45,100			$45,100
12	SM TOOLS/CONSM'BLS						$15,900	$15,900
13	EQUIPMENT RENTAL					$1,806,890		$1,806,890
14	TEMP. FACILITIES				$5,600		$10,300	$15,900
15	TEMP UTL'S HOOK-UP				$2,800		$5,200	$8,000
16	JOB CLEAN-UP				$5,600		$10,300	$15,900
17	SAFETY				$2,800		$5,200	$8,000
18	HEALTH PHYSICS				$65,400			$65,400
19	CERCLA	$1,500 PER PERSON				$12,000		$12,0[illegible]
20	BOND					$10,500		$10,5[illegible]
21	OVERHEAD & PROFIT					$274,800		$274,800
22	PAYRL BRD.&BENFT.				$204,000			$204,000
	INDIRECT FIELD COSTS				**$331,300**	**$2,104,190**	**$46,900**	**$2,482,390**
	DIRECT & INDIRECT FIELD COSTS				**$596,306**	**$2,104,190**	**$831,477**	**$3,531,990**
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$3,700		$6,800	$10,500
26	PROJ.MGMT-FERMCO				$211,919			$336,700
27	CONSTR MGMT-FERMCO				$247,239			$247,239
	FERMCO FIELD SUPPORT COSTS							**$594,439**
28								
29								
30	ENGINEERING	**TITLE I**	**TITLE II**		**TITLE III**			$600,400
	ENGINEERING COSTS							**$600,400**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$838,277	$50,300
	SUB-TOTAL (BASE ESTIMATE)							**$4,777,129**
32								
33	ESCALATION							
34	RISK BUDGET	19.0%						$907,655
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$5,684,784**
35	CONTINGENCY	13.0%						$621,0[illegible]
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**							**$6,305,81[illegible]**
37								

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CONTR.NO.- 24321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS RAIL SIDING
LOCATION- FERNALD, OHIO
PROJ.CTL.-
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BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.C193-9-7-6

DATE: 02/18/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	GENERAL SITE WORK												
	SITE DEMOLITION												
	GRADE AND FILL 2200' X 20'	5000	SY	0.050	250	16.51				$4,128			$4,128
	COMPACT FILL	5000	SY	0.030	150	16.51				$2,477			$2,477
	RAIL BALLAST	2500	CY	1.000	2,500	16.51			13	$41,275		$31,250	$72,525
	125 # RAIL	2600	LF	0.500	1,300	16.51			185	$21,463		$481,000	$502,463
	SCALE 150 TON 72' x 10'	1.0	EA		300	19.00			33800	$5,700		$33,800	$39,500
	CONCRETE 200' x 100' x 12"	741	CY	7.430	5,506	16.51			103	$90,904		$76,027	$166,931
	METAL BLDG 100'x50'x25'HT	5000	SF	0.30	1,500	16.51			10.00	$24,765		$50,000	$74,765
	SITEWORK CONCRETE	5000	SF	0.60	3,000	16.51			15.00	$49,530		$75,000	$124,530
	HVAC	5000	SF	0.12	600	16.51			3.00	$9,906		$15,000	$24,906
	PLUMBING	5000	SF	0.06	300	16.51			1.50	$4,953		$7,500	$12,453
	ELECTRICAL	5000	SF	0.12	600	16.51			3.00	$9,906		$15,000	$24,906
	TOTAL EXCAVATION & CIVIL				16,006					$265,006		$784,577	$1,049,583
	ALLOWANCE FOR EQUIPMENT FOR GRADE AND FILL										$95,000		$95,000
	ALLOWANCE FOR COMPACTION EQUIPMENT										$50,050		$50,050
	RAILROAD INSTALLATION EQUIPMENT ALLOWANCE										$472,000		$472,000
	30 TON FORK LIFT	60	MO						5959			$357,540	$357,540
	FORKLIFT FORKLIFT OPERATION	6000	HR						16.50			$99,000	$99,000
	YARD LOCOMOTIVE	60.0	MO						10735		$644,100		$644,100
	LOCOMOTIVE OPERATION	4,000.0	HR						22.30		$89,200		$89,200
	TOTAL EQUIPMENT RENTAL										$1,350,350	$456,540	$1,806,890

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: ROTARY DRYING (5 YEAR)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-6
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

The pit wastes, caps, and liners would be processed by indirect rotary drying system. Prior to the drying process, a crusher-shredder would size-reduce the material to less than 6 inches in diameter. The waste drying system would process approximately 183,200 dry tons of excavated waste material per year. At this process rate all waste material would be treated within approximately 5 years. This cost component is applicable to Alternatives 4B, 5A, and 5B. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- An estimated 4,000 linear feet (LF) of eight-inch diameter gas line would be installed to service the dryers. Installation would involve the excavation of approximately 6,000 cubic yards (CYs) of soil.

MACHINERY AND EQUIPMENT

- A feed preparation system for processing Pit 5 wastes (to be dredged) would be installed inside the pretreatment facility. The preparation system would consist of a 500 gallon per minute sludge thickener, 400 gallon per minute clarifier, and 250 wet tons per hour drum filter.

- A drag scrapper with a triple-drum hoist and cable system to feed waste material to a multi-stage crusher-shredder with a nominal capacity of 60 wet tons per hour would be installed inside the pretreatment facility.

- A multi-stage crusher-shredder with a nominal capacity of 60 wet tons per hour would be installed inside the pretreatment facility.

- Two (2) parallel indirect rotary drying systems each consisting of an indirect rotary dryer, furnace, and material conveyance mechanism (screw conveyor) would be installed. An allowance has been provided for the fuel required by the dryer for a five year operating period.

- A process off-gas treatment system consisting of one 5300 scfm condenser and scrubber, mist eliminator, water removal knock-out drum, HEPA filters, and exhaust fan would be installed inside the pretreatment facility to process treatment off-gases.

- The labor hours for operation of the equipment identified in this cost component, based on operating in Level D conditions, was estimated at 180,000 labor hours. Since the majority of the personnel associated with operation of this equipment would be required to work in Level B conditions, this quantity was multiplied by a productivity factor of 2.1 to yield 378,000 total labor hours (an additional 198,000 labor hours), or the effort required to execute the same activities in Level B conditions.

- An estimated 600 linear feet of enclosed belt conveyor to transfer dried waste to operational storage silos (Alternative 5A and 5B) or to transfer dried waste to the cementation-solidification facility (Alternative 4B) would be installed.

PIPING

- An estimated 4,000 linear feet (LF) of eight-inch diameter gas line would be installed to service the dryers.

ELECTRICAL

- An allowance has been provided for the installation of all electrical equipment and controls required to operate the process equipment identified with this cost component.

HEALTH PHYSICS

- For cost estimating purposes, Level B personal protective equipment would be required for an estimated 23,625 man days.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-6

CLIENT: US DOE

PROJECT TITLE: FS ROTARY DRYING (5 YEAR)

FERMCO ESTIMATING SERVICES

SUMMARY SHEET

DATE: 26-Feb-94

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	3,000		$99,060			$99,100
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT, INSTALLATION	20,340		$386,300	$360,000	$10,382,100	$11,128,400
		MACHINERY AND EQUIPMENT, OPERATION	428,000		$7,190,780			$7,190,800
6		PIPING	14,000		$266,000		$230,000	$496,000
7		ELECTRICAL	25,000		$460,500		$1,000,000	$1,460,500
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		490,340		$8,402,640	$360,000	$11,612,100	$20,374,800
11	SUPERVISION - CONTRACTOR				$1,428,400			$1,428,400
12	SM TOOLS/CONSM'BLS						$504,200	$504,200
13	EQUIPMENT RENTAL						$1,716,190	$1,716,190
14	TEMP. FACILITIES				$176,500		$327,700	$504,200
15	TEMP UTL'S HOOK-UP				$88,200		$163,900	$252,100
16	JOB CLEAN-UP				$176,500		$327,700	$504,200
17	SAFETY				$88,200		$163,900	$252,100
18	HEALTH PHYSICS						$5,906,250	$5,906,250
19	CERCLA	$1,500 PER PERSON				$367,800		$367,[illegible]
20	BOND					$203,700		$203,7[illegible]
21	OVERHEAD & PROFIT					$2,881,300		$2,881,300
22	PAYRL BRD.&BENFT.				$5,387,400			$5,387,400
	INDIRECT FIELD COSTS				$7,345,200	$3,452,800	$9,109,840	$19,907,840
	DIRECT & INDIRECT FIELD COSTS				$15,747,840	$3,812,800	$20,721,940	$40,282,640
	FUEL GAS						$3,515,000	$3,515,000
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$71,300		$132,400	$203,700
26	PROJ.MGMT-FERMCO				$2,417,000			$2,417,000
27	CONSTR MGMT-FERMCO				$2,819,800			$2,819,800
	FERMCO FIELD SUPPORT COSTS							$8,955,500
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$6,848,000
	ENGINEERING COSTS							$6,848,000
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$24,369,340	$1,462,200
	SUB-TOTAL (BASE ESTIMATE)							$57,548,340
32								
33	ESCALATION							
34	RISK BUDGET	23.0%						$13,236,118
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$70,784,458
35	CONTINGENCY	13.0%						$7,481,[illegible]
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$78,265,742
37								

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CONTR.NO.– [redacted]4321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS ROTARY DRYING
LOCATION– FERNALD, OHIO
PROJ.CTL.–

BASED UPON A FIVE YEAR OPE[redacted]ON PLAN

BUDGET ESTIMATE DETAILS

CONTR.NO.– [redacted]4424321
EST. NO. C1–93–9–6–

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MACHINERY & EQUIPMENT												
	THICKENER WITH FILTER 25' X 10' TANK 3' X 6' FILTE	1	EA		1320		19			$25,000		$75,000	$100,000
	CLARIFIER	1	EA		1320		19			$25,000		$75,000	$100,000
	HOPPERS	2	EA		500		19			$9,500		$10,000	$19,500
	BUCKET CONVEYOR	1	EA		600		19			$11,400		$17,100	$28,500
	SCREW CONVEYOR	2	EA		600		19			$11,400		$50,000	$61,400
	ENCLOSED BELT CONVEYOR TO STORAGE SILOS	600	LF					600			$360,000		$360,000
	CRUSHER 60 TONS PER HR	1.0	EA									$3,200,000	$3,200,000
	ROTARY DRYER 10' X 85' W/GAS FIRED FURNACE	2.0	EA						6.4M			$6,400,000	$6,400,000
	OFF GAS TREATMENT/CONDENCER/MIST ELIMINATE	15000	CFM	0.50	7500		19		16.00	$142,500		$240,000	$382,500
	HEPA FILTRATION	15000	CFM	0.50	7500		19		16.00	$142,500		$240,000	$382,500
	DRAG SCRAPER INC. HOISTS/CONTROLS	1	EA		1000		19			$19,000		$75,000	$94,000
	MACHINERY AND EQUIPMENT INSTALL				20340					$386,300	$360,000	$10,382,100	$11,128,400
	OPERATIONAL LABOR 6 MEN X 8 HRS X 3 SHIFTS X 250 DAYS A YR X 5 YRS	180000	HR		180000		16.51			$2,971,800			$2,971,800
	PRODUCTIVITY FACTOR @ 2.1 X OPERATION LABOR 1.1 X 180,000 HRS=	198000	HR		198000		16.51			$3,268,980			$3,268,980
	MAINTENANCE 5 MEN X 8 HRS X 250 DAYS X 5 YRS	50000	HR		50000		19			$950,000			$950,000
	MACHINERY AND EQUIPMENT OPERATION				428000					$7,190,780			$7,190,780

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CONTR.NO.– 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS ROTARY DRYING
LOCATION– FERNALD, OHIO
PROJ.CTL.–

BASED UPON A FIVE YEAR OPERATION PLAN

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1–93–9–6–

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	FUEL GAS @11 X 10/6 BTU	9.5	MCF						$0.37			$3,515,000	$3,515,000
	TOTAL FUEL GAS 5 YR OPERATION												$3,515,000
	GAS LINE EXCAVATION	6000	CY	0.50	3000	16.51				$99,060			$99,060
	TOTAL EXCAVATION AND CIVIL												$99,060
	PIPING												
	GAS LINE 8"	4000	LF	1.000	4000	19.00			20.00	$76,000		$80,000	$156,000
	COMPRESSED AIR ETC	10000	HR		10000	19.00				$190,000		$150,000	$340,000
	TOTAL PIPING				14000					$266,000		$230,000	$496,000
	ELECTRICAL/CONTROLS	ALLOW			10000		19			$190,000		$250,000	$440,000
	ELECTRICAL/CONTROLS	ALLOW		15000	15000	18.00				$270,000		$750,000	$1,020,000
	TOTAL ELECTRICAL									$460,000		$1,000,000	$1,460,000
	PPE SUITE UPS @ 50% OF OPERATION LABOR 378000 HRS =47250 DAYS X 50% =23625	23625	EA						250.00			$5,906,250	$5,906,250
	TOTAL HEALTH & PHYSICS											$5,906,250	$5,906,250

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: ROTARY DRYING (10 YEAR)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-6R
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

The pit wastes, caps, and liners would be processed by indirect rotary drying system. Prior to the drying process, a crusher-shredder would size-reduce the material to less than 6 inches in diameter. The waste drying system for vitrification would process approximately 91,600 dry tons of excavated waste material per year. At this process rate all waste material would be treated within approximately 10 years. This cost component is applicable to Alternative 4A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- An estimated 4,000 linear feet (LF) of eight-inch diameter gas line would be installed to service the dryers. Installation would involve the excavation of approximately 6,000 cubic yards (CY) of soil.

MACHINERY AND EQUIPMENT

- A feed preparation system for Pit 5 wastes (to be dredged) consisting of a 500 gallon per minute sludge thickener, 400 gallon per minute clarifier, and 250 wet tons per hour drum filter would be constructed inside the pretreatment facility.

- A drag scrapper with a triple-drum hoist and cable system to feed waste material to a multi-stage crusher-shredder with a nominal capacity of 45 wet tons per hour would be installed inside the pretreatment facility.

- A multi-stage crusher-shredder with a nominal capacity of 45 wet tons per hour would be installed inside the pretreatment facility.

- Two (2) parallel indirect rotary drying systems each consisting of an indirect rotary dryer, furnace, and conveyance mechanism (screw conveyor) would be installed. Each system would be rated for 30 wet tons per hour.

- A process off-gas treatment system consisting of a 5300 scfm condenser and scrubber, mist eliminator, water removal knock-out drum, HEPA filters, and exhaust fan would be installed inside the pretreatment facility to process treatment off-gases.

- The labor hours for operation of the equipment identified in this cost component, based on operating in Level D conditions, was estimated at 360,000 labor hours. Since the majority of the personnel associated with operation of this equipment would be required to work in Level B conditions, this quantity was multiplied by a productivity factor of 2.1 to yield 756,000 total labor hours (an additional 396,000 labor hours), or the effort required to execute the same activities in Level B conditions.

- An estimated 600 linear feet of enclosed belt conveyor to transfer dried waste to the vitrification facility will be installed.

PIPING

- An estimated 4,000 linear feet (LF) of eight-inch diameter gas line would be installed to service the dryers.

ELECTRICAL

- An allowance has been provided for the installation of all electrical equipment and controls required to operate the process equipment identified with this cost component.

HEALTH PHYSICS

- For cost estimating purposed, Level B personal protective equipment would be required for an estimated 53,500 man days.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-6R

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: FS ROTARY DRYING (10 YEAR)

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	3,000		$99,060			$99,100
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT, INSTALLATION	20,340		$386,300	$360,000	$8,482,100	$9,228,400
		MACHINERY AND EQUIPMENT, OPERATION	856,000		$14,381,560			$14,381,600
6		PIPING	14,000		$266,000		$230,000	$496,000
7		ELECTRICAL	25,000		$460,500		$1,000,000	$1,460,500
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		918,340		$15,593,420	$360,000	$9,712,100	$25,665,600
11	SUPERVISION - CONTRACTOR				$2,650,900			$2,650,900
12	SM TOOLS/CONSM'BLS						$935,600	$935,600
13	EQUIPMENT RENTAL						$3,214,190	$3,214,190
14	TEMP. FACILITIES				$327,500		$608,100	$935,600
15	TEMP UTL'S HOOK-UP				$163,700		$304,100	$467,800
16	JOB CLEAN-UP				$327,500		$608,100	$935,600
17	SAFETY				$163,700		$304,100	$467,800
18	HEALTH PHYSICS						$13,375,000	$13,375,000
	ERCLA	$1,500 PER PERSON				$688,800		$688,800
	BOND					$256,700		$256,700
21	OVERHEAD & PROFIT					$4,463,400		$4,463,400
22	PAYRL BRD.&BENFT.				$9,997,900			$9,997,900
	INDIRECT FIELD COSTS				$13,631,200	$5,408,900	$19,349,190	$38,389,290
	DIRECT & INDIRECT FIELD COSTS				$29,224,620	$5,768,900	$29,061,290	$64,054,890
	FUEL GAS						$4,884,000	$4,884,000
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$89,800		$166,800	$256,600
26	PROJ.MGMT-FERMCO				$3,843,300			$3,843,300
27	CONSTR MGMT-FERMCO				$4,483,800			$4,483,800
	FERMCO FIELD SUPPORT COSTS							$13,467,700
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$10,889,300
	ENGINEERING COSTS							$10,889,300
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$34,112,090	$2,046,700
	SUB-TOTAL (BASE ESTIMATE)							$90,458,590
32								
33	ESCALATION							
34	RISK BUDGET	23.0%						$20,805,476
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$111,264,066
	CONTINGENCY	12.0%						$10,855,031
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$122,119,097
37								

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CONTR.NO.– 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS ROTARY DRYING
LOCATION– FERNALD, OHIO
PROJ.CTL.–

BASED UPON A TEN YEAR OPERATION PLAN

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1–93–9–6–

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	FUEL GAS												
	FUEL GAS BTU @11X 10/6 =	13.2M	MCF						0.37			$4,884,000	$4,884,000
	TOTAL FUEL GAS FOR TEN YRS												$4,884,000
	GAS LINE EXCAVATION	6000	CY	0.50	3000	16.51				$99,060			$99,060
	TOTAL EXCAVATION & CIVIL												$99,060
	GAS LINE 8"	4000	LF	1.000	4000	19.00			20.00	$76,000		$80,000	$156,000
	COMPRESSED AIR ETC	10000	HR		10000	19.00				$190,000		$150,000	$340,000
	TOTAL PIPING				14000					$266,000		$230,000	$496,000
	ELECTRICAL/CONTROLS FOR HEPA FILTRATION	ALLOW		10000		18.42				$184,200		$250,000	$434,200
	ELECTRICAL/CONTROLS DRYER & CRUSHER	ALLOW		15000		18.42				$276,300		$750,000	$1,026,300
	TOTAL ELECTRICAL									$460,500		$1,000,000	$1,460,500
	PPE SUITE UPS @ 50% OF OPERATION LABOR 856000 HRS = 107000 DAYS X 50% =	53500	EA						250.00			$13,375,000	$13,375,000
	TOTAL HEALTH & PHYSICS												$13,375,000

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CONTR.NO.- 24321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS ROTARY DRYING
LOCATION- FERNALD, OHIO
PROJ.CTL.-

BASED UPON A TEN YEAR OPERATION PLAN

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-6-

DATE: 02/17/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MACHINERY & EQUIPMENT												
	THICKENER WITH FILTER 25' X 10' TANK 3' X 6' FILTE	1	EA		1320		19.00			$25,000		$75,000	$100,000
	CLARIFIER	1	EA		1320		19.00			$25,000		$75,000	$100,000
	HOPPERS	2	EA		500		19.00			$9,500		$10,000	$19,500
	BUCKET CONVEYOR	1	EA		600		19.00			$11,400		$17,100	$28,500
	SCREW CONVEYOR	2	EA		600		19.00			$11,400		$50,000	$61,400
	ENCLOSED BELT CONVEYOR	600	LF					600			$360,000		$360,000
	CRUSHER 60 TONS PER HR	1.0	EA									$3,200,000	$3,200,000
	ROTARY DRYER 10' X 85' W/GAS FIRED FURNACE	2.0	EA						4.5M			$4,500,000	$4,500,000
	OFF GAS TREATMENT/CONDENCER/MIST ELIMINATE	15000	CFM	0.50	7500		19.00		16.00	$142,500		$240,000	$382,500
	HEPA FILTRATION	15000	CFM	0.50	7500		19.00		16.00	$142,500		$240,000	$382,500
	DRAG SCRAPER INC. HOISTS/CONTROLS	1	EA		1000		19.00			$19,000		$75,000	$94,000
	MACHINERY AND EQUIPMENT INSTALL				20340					$386,300	$360,000	$8,482,100	$9,228,400
	OPERATIONAL LABOR 6 MEN X 8 HRS X 3 SHIFTS X 250 DAYS A YR X 10 YRS	360000	HR		360000		16.51			$5,943,600			$5,943,600
	PRODUCTIVITY FACTOR @2.1 x OPERATION LABOR 1.1X360,000HRS=	396000	HR		396000		16.51			$6,537,960			$6,537,960
	MAINTENANCE 5 MEN X 8 HRS X 250 DAYS X 10 YRS	100000	HR		100000		19.00			$1,900,000			$1,900,000
	MACHINERY AND EQUIPMENT OPERATION				856000					$14,381,560			$14,381,560

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6092

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: VITRIFICATION EQUIPMENT AND OPERATION
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-3
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Waste material leaving the dryers would be subjected to screening and size-reduction to remove any non-vitrifiable material and provide appropriately sized material to the vitrifiers. The waste material would then be blended with glass-forming additives to form the appropriate vitrifier feed composition. The additive-blended waste would be fed into the vitrification furnaces for processing at the rate of 400 tons per day. At this processing rate all waste material would be treated within approximately 10 years. This cost component is applicable to Alternative 4A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- An estimated 20,000 square yards (SYs) of vegetated area would require clearing and grubbing in preparation of treatment facility construction activities. The area would then be graded and contoured; filling would be performed where necessary. The volume of fill material required is estimated at 2,000 cubic yards (CYs) and would be obtained from on-site sources.

- A pre-engineered metal building, sized to enclose the vitrification process equipment, would be constructed.

CONCRETE

- Approximately 1,951 CYs of structural grout would be required for building foundations and equipment footings. An estimated 162 tons of steel would be required for reinforcement.

STRUCTURAL STEEL

- The treatment facility would be constructed of an estimated 250 tons of structural steel frames and roof trusses, 31,000 square feet (SF) of insulated metal side walls, and 46,000 SF of insulated roof panels.

MACHINERY, EQUIPMENT, AND OPERATION

- A material handling system consisting of an apron feeder, bucket elevator, and horizontal conveyor with traveling tripper, would be installed to transfer vitrification feed material to four (4) vitrifier feed bins. Materials from the bins would be withdrawn at a controlled rate and transferred for blending with the necessary additives to prepare the appropriate furnace feed composition. The waste blended with additives would be fed through the top of four (4) joule-heated vitrification furnaces, each with a capacity of 100 tons/day.

- Off-gas treatment systems consisting of 5400 scfm quench vessels, 5400 scfm combination venturi/packed-bed scrubbers, mist eliminators, HEPA filter banks, and exhaust fans would be installed to process vitrification facility off gases.

- A material handling systems consisting of four (4) product quenchers, four (4) apron feeders, one (1) material handling conveyor, one (1) bucket elevator, and one (1) material storage silo would be installed for transferring the frit to a loadout point immediately prior to transfer to the disposal cell. Frit would be discharged from the silo directly onto a conveyor for transfer to the disposal facility.

PIPING

- Approximately 3,000 linear feet (LF) of buried six-inch diameter water pipe, 18-inch diameter sewer pipe, and eight-inch diameter fire main would be installed to service the treatment facility.

ELECTRICAL

- An allowance has been provided for the construction of an electrical substation to meet the power requirements of the treatment facility (including installation of treatment facility instrumentation). Power consumption is based on operating four vitrification units 250 days per year for a period of 10 years.

VITRIFICATION ADDITIVES

- For costing purposes, the glass formulation for the vitrifiers is assumed to be 60 percent waste, 20 percent soil, 10 percent silica sand, and 10 percent sodium carbonate flux. Based on a total waste and soil quantity of 916,000 dry tons, an estimated 114,500 tons each of silica sand and sodium carbonate flux would be required for material treatment.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- The cost associated with the four (4) joule-heated vitrification furnaces was obtained from a conceptual design report prepared by the Ralph M. Parsons, Corporation (Conceptual Design Report for the Remediation of Waste Pit Area, Removal, Treatment, and On-Site Disposal, Volume II of III, December 1992, Revision B).

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

6097

EST FILE #: C1-93-9-3

FERMCO ESTIMATING SERVICES

DATE: 21-Jun-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: VITRIFICATION,EQUIPMENT & OPERATION

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	3,800		$62,738			$62,700
2		CONCRETE	4,912		$86,258		$250,209	$336,500
3		STRUCTURAL STEEL	47,221		$897,199		$1,375,950	$2,273,100
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT & OPERATIONCOST	734,000		$12,153,200		$17,840,000	$29,993,200
6		PIPING	18,300		$310,350		$240,000	$550,400
7		ELECTRICAL	66,000		$1,188,000	$1,500,000	$2,900,000	$5,588,000
8		INSTRUMENTS						
9								
10								
		DIRECT FIELD COSTS	**874,233**		**$14,697,745**	**$1,500,000**	**$22,606,159**	**$38,803,900**
		VITRIFICATION ADDITIVES					$28,625,000	$28,625,000
11		SUPERVISION - CONTRACTOR			$2,498,617			$2,498,617
12		SM TOOLS/CONSM'BLS					$881,900	$881,900
13		EQUIPMENT RENTAL				$3,109,280		$3,109,280
14		TEMP. FACILITIES			$308,700		$573,200	$881,900
15		TEMP UTL'S HOOK-UP			$154,300		$286,600	$440,900
16		JOB CLEAN-UP			$308,700		$573,200	$881,900
17		SAFETY			$154,300		$286,600	$440,900
18		HEALTH PHYSICS			$3,624,500			$3,624,500
		CERCLA $1,500 PER PERSON				$655,700		$655,700
		BOND				$388,000		$388,000
21		OVERHEAD & PROFIT				$7,310,900		$7,310,900
22		PAYRL BRD.&BENFT.			$7,371,100			$7,371,100
		INDIRECT FIELD COSTS			**$14,420,217**	**$11,463,880**	**$31,226,500**	**$57,110,597**
		DIRECT & INDIRECT FIELD COSTS			**$29,117,962**	**$12,963,880**	**$53,832,659**	**$95,914,497**
		ELECTRICAL POWER COST					$46,200,000	$46,200,000
23		TRANSPORTATION & BURIAL						
24		WASTE CONTAINERS						
25		SOIL/WATER/AIR			$135,800		$252,200	$388,000
26		PROJ.MGMT-FERMCO			$5,754,900			$5,754,900
27		CONSTR MGMT-FERMCO			$6,714,000			$6,714,000
		FERMCO FIELD SUPPORT COSTS						**$59,056,900**
28								
29								
30		ENGINEERING TITLE I	TITLE II		TITLE III			$16,305,500
		ENGINEERING COSTS						**$16,305,500**
31		SALES TAX 6.0%	SUB-TOTAL MATERIAL DOLLARS				$100,284,859	$6,017,100
		SUB-TOTAL (BASE ESTIMATE)						**$177,293,997**
32								
33		ESCALATION						
34		RISK BUDGET 24.0%						$42,550,559
		TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)						**$219,844,556**
		CONTINGENCY 13.0%						$23,048,220
36		**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**						**$242,892,775**
37								

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000086

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS/PP VITRIFICATION FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–3

DATE: 06/21/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	CLEAR AND GRUB INCLUDING LAY DOWN AREA	20000	SY	0.070	1,400	16.51				$23,114			$23,114
	FINISH GRADE & COMPACT	20000	SY	0.070	1,400	16.51				$23,114			$23,114
	FILL FROM ON SITE	2000	CY	0.500	1,000	16.51				$16,510			$16,510
	TOTAL EAXACVATION & CIVIL				3,800					62,738			$62,738

000087

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS/PP VITRIFICATION FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–3
DATE: 06/21/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	CONCRETE												
	GRADE BEAMS 2'WX2'HTX(200+200+220+220) = 3360 CF	124	CY	1.00	124	17.56			$58	$2,185		$7,218	$9,403
	FORMWORK FOR GRADE BEAMS 2'HTx(220+220+200+200)x2SIDES = 3360 SFCA	3360	SFCA	0.10	336	17.56			$2	$5,900		$6,720	$12,620
	SLAB ON GRADE	1086	CY	0.50	543	17.56			$58	$9,535		$62,988	$72,523
	EQUIPMENT FOUNDATION PADS TOTAL EXPECTED EQUIPMENT = 20 EACH PAD IS 20X25X2'DEEP TOTAL CONCRETE = 20 PADX20X25X2 = 20000 CF	741	CY	1.00	741	17.56			$58	$13,007		$42,963	$55,970
	FORMWORK FOR PADS 20 PADSX2'HTX(20+20+25+25)=3600 SFCA	3600	SFCA	0.25	900	17.56			$2	$15,804		$7,200	$23,004
	REINFORCEMENT 150 LBS PER CY OF CONCRETE TOTAL CONCRETE FROM ABOVE =(741+1086+124)= 1951 CY 1951X150LBS STEEL=292650 LBS= 292650/2000= 147TONS+10% WASTAGE = 147+15=162 TONS	162	TONS	14.00	2268	17.56			$760	$39,826		$123,120	$162,946
	TOTAL CONCRETE				4,912					86,258		250,209	$336,46

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6097

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS/PP VITRIFICATION FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–3
DATE: 06/21/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	STRUCTURAL STEEL												
	STEEL COLUMNS	100	TONS	30	3000	19.00			2200	$57,000		$220,000	$277,000
	BEAMS	30	TONS	30	900	19.00			2200	$17,100		$66,000	$83,100
	STEEL GIRTS,WIND BRACE ETC	120	TONS	30	3600	19.00			2200	$68,400		$264,000	$332,400
	INSULATED METAL SIDING	31000	SF	0.16	5084	19.00			5.35	$96,596		$165,850	$262,446
	INSULATED METAL ROOF	46000	SF	0.16	7360	19.00			5.50	$139,840		$253,000	$392,840
	DOORS	12	EA	12	144	19.00			800	$2,736		$9,600	$12,336
	ROLL UP DOORS ELECTRICALLY OPERATED	4	EA	63	253	19.00			3500	$4,807		$14,000	$18,807
	UNDERGROUND UTILITY PIPES ALLOWANCE	1.0	EA	6580	6580	19.00			125000	$125,020		$125,000	$250,020
	HEATING AND VENTILATING	46000	SF	0.15	6900	19.00			2.65	$131,100		$121,900	$253,000
	FIRE PROTECTION	46000	SF	0.10	4600	19.00			2.35	$87,400		$108,100	$195,500
	ROOF DRAINS	700	FT	1	700	19.00			35.00	$13,300		$24,500	$37,800
	MISC ALLOWANCE	1.0	EA	400	400	19.00			4000	$7,600		$4,000	$11,600
	PRODUCTIVITY ALLOWANCE				3800	19.00				$72,200			$72,200
	TAKE OFF ALLOWANCE				3900	19.00				$74,100			$74,100
	TOTAL (STRUCTURAL STEEL)				47,221					$897,199		$1,375,950	$2,273,150

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CONTR. 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS/PP VITRIFICATION FACILITY
LOCATION– FERNALD, OHIO
PROJ.CTL.–

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1–93–9–3
BY: D HOPP/UT
DATE: 06/21/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	VITRIFICATION EQUIPMENT												
	PER PARSONS STUDY 4 EA @ 4.2 MILL	4	EA						4.2M			$16,800,000	$16,800,000
	FEED CONVEYOR INC HOPPERS	4	EA		4000	19				$76,000		$240,000	$316,000
	OFF GAS TREATMENT SYSTEMS	4	EA		10000	19.00				$190,000		$800,000	$990,000
	EQUIPMENT OPERATION 12 MENX8 HRSX3SHIFTS X250 DAYS YR X 10 YRS = INC MAINTENANCE	720000	HRS		720000	16.51				$11,887,200			$11,887,200
	TOTAL EQUIPMENT				734,000					12,153,200		17,840,000	$29,993,200

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS/PP VITRIFICATION FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–3
DATE: 06/21/9

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	UNDER GROUND WATER PIPING 6" DI 5' DEEP	3000	LF	0.50	1500	19			20	$28,500		$60,000	$88,50
	EXCAVATION, BEDDING & BACKFILL 5'DEEP	3000	LF	1.00	3000	16.51				$49,530			$49,53
	SEWER 18"	3000	LF	1.00	3000	16.51			25	$49,530		$75,000	$124,53
	EXCAVATION, BEDDING & BACKFILL 5'DEEP	3000	LF	1.50	4500	16.51				$74,295			$74,29
	FIRE MAIN/PROCTECTION 8"	3000	LF	0.60	1800	19			35	$34,200		$105,000	$139,20
	EXCAVATION, BEDDING & BACKFILL 5'DEEP	3000	LF	1.50	4500	16.51				$74,295			$74,29
		18000			18,300					$310,350		$240,000	$550,35
	ELECTRIAL												
	SUB STATION FOR VITRIFICATION EQUIPMENT										$1,500,000		$1,500,00
	ELECTRIAL/CONTROLS VIT EQUIPMENT				66,000	18.00				$1,188,000		$2,900,000	$4,088,00
										$1,188,000	$1,500,000	$2,900,000	$5,588,00
	POWER USAGE ASSUME 5.5 MW X 1000 KW X .035 = DAY COST X 250 DAYS X 10 YEARS X 4 UNITS											$46,200,000	$46,200,00

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS/PP VITRIFICATION FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–3

DATE: 06/21/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS			COST/UNIT			LABOR	SUB CONTRACT	MATERIAL	TOTAL
				UNIT	TOTAL	RATE	LABOR	SUB	MAT'L				
	ADDITIVES FOR VITRIFICATION												
	SILICA SAND	114,500	TON						100			$11,450,000	$11,450,000
	SODIUM CARBONATE	114,500	TON						150			$17,175,000	$17,175,000
	TOTAL ADDITIVES												$28,625,000

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PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: CEMENT-SOLIDIFICATION EQUIPMENT AND OPERATION
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-4
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Waste material leaving the dryers would be transferred and discharged into one of three feed hoppers. Automatic samplers would withdraw samples of waste material from the feed hoppers. Analysis of the sample would determine the proper ratios of cement and fly ash additives as well as any additional water requirements to produce a cement stabilized waste that meets the waste acceptance criteria for the disposal cell. Once the formulation requirements are identified, the waste material would be conveyed from the feed hoppers to one of four pugmill mixers. Additive materials (cement and fly ash) would be also be conveyed into the pug mills. Solidified waste from the pugmill mixers would be collected and discharged into a loadout/transfer system for transfer to the on-site disposal facility. This cost component is applicable to Alternative 4B only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Approximately 13,040 cubic yards (CYs) of soil would be excavated from the site of the treatment facility in preparation for construction.

CONCRETE

- Approximately 1,951 CYs of structural grout would be required for building foundations and equipment footings. An estimated 162 tons of steel would be required for reinforcement.

STRUCTURAL STEEL

- A pre-engineered metal building with concrete foundation would be constructed to enclose the treatment equipment.

- The treatment facility would be constructed of an estimated 190 tons of structural steel frames and roof trusses, 21,000 square feet (SF) of insulated metal side walls, and 44,000 SF of insulated roof panels.

MACHINERY, EQUIPMENT, AND OPERATION

- Waste material leaving the dryers would be transferred to one of three (3) feed hoppers. Three feed hoppers are provided to ensure proper mix design. Operationally, one hopper would be on line to the mixers, a second hopper would be full and awaiting sample testing results while the third hopper would be in the process of being filed with waste. Hoppers would be designed to include surge capacity to compensate for the operational time difference between the crusher-shredder and the mixers. Each hopper would be fitted with vibrating discharge and automatic sampling system.

- Waste material would be conveyed from the feed hoppers to one of four (4) pugmill mixers.

- Additive materials would be withdrawn from the additives silos and conveyed into the pugmill mixers at rates determined by the formulation requirements. Two (2) storage silos, each with a capacity of 1500 dry tons, would be constructed adjacent to the treatment facility to stage the additives.

- Cement stabilized waste from the mixers would be collected and discharged into the stabilized cement load out/transfer system for transfer to the disposal cell. Cement stabilized waste would be placed into the cell through a distributor conveyor, and spread and compacted in 12-inch thick lifts with conventional earth moving equipment. The transfer conveyance system would be designed to accommodate a capacity of 180 tons per hour.

PIPING

- Approximately 3,000 LF of buried six-inch diameter water pipe, 18-inch diameter sewer pipe, and eight-inch diameter fire main would be installed to service the treatment facility.

ELECTRICAL

- An electrical substation would be installed to meet the power requirements of the treatment facility (including installation of treatment facility instrumentation).

ELECTRICAL POWER

- An allowance has been provided for the power consumption required by the cementation-solidification equipment over a five year operating period.

CEMENTATION ADDITIVES

- Approximately 687,000 tons of cement and 344,000 tons of fly ash would be required to stabilize the waste.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

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EST FILE #: C1-93-9-4

FERMCO ESTIMATING SERVICES

DATE: 21-Jun-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: CEMENTATION,EQUIPMENT & OPERATION

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION		M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
		EXCAVATION AND CIVIL		3,800		$62,738			$62,700
2		CONCRETE		4,912		$86,258		$250,209	$336,500
3		STRUCTURAL STEEL		42,147		$801,100		$1,162,500	$1,963,600
4		BUILDINGS							
5		MACHINERY AND EQUIPMENT	INSTALLATION	49,400		$975,700		$5,628,000	$6,603,700
			OPERATION	360,000		$7,110,000			$7,110,000
6		PIPING		18,300		$310,350		$240,000	$550,400
7		ELECTRICAL		13,000		$234,000		$700,000	$934,000
8		INSTRUMENTS							
9									
10									
	DIRECT FIELD COSTS			491,559		$9,580,146		$7,980,709	$17,560,900
11	SUPERVISION - CONTRACTOR					$1,629,000			$1,629,000
12	SM TOOLS/CONSM'BLS							$574,800	$574,800
13	EQUIPMENT RENTAL						$1,717,000		$1,717,000
14	TEMP. FACILITIES					$201,200		$373,600	$574,800
15	TEMP UTL'S HOOK-UP					$100,600		$186,800	$287,400
16	JOB CLEAN-UP					$201,200		$373,600	$574,800
17	SAFETY					$100,600		$186,800	$287,400
18	HEALTH PHYSICS					$2,362,500			$2,362,500
19	CERCLA	$1,500 PER PERSON					$368,700		$368,700
20	BOND						$175,600		$175,600
21	OVERHEAD & PROFIT						$2,350,200		$2,350,200
22	PAYRL BRD.&BENFT.					$7,371,100			$7,371,100
	INDIRECT FIELD COSTS					$11,966,200	$4,611,500	$1,695,600	$18,273,300
	DIRECT & INDIRECT FIELD COSTS					$21,546,346	$4,611,500	$9,676,309	$35,834,200
	ELECTRICAL POWER COST							$1,500,000	$1,500,000
	CEMENTATION ADDITIVES							$49,820,000	$49,820,000
23	TRANSPORTATION & BURIAL								
24	WASTE CONTAINERS								
25	SOIL/WATER/AIR					$61,500		$114,100	$175,600
26	PROJ.MGMT-FERMCO					$2,150,100			$2,150,100
27	CONSTR MGMT-FERMCO					$2,508,400			$2,508,400
	FERMCO FIELD SUPPORT COSTS								$56,154,100
28									
29									
30	ENGINEERING	TITLE I	TITLE II			TITLE III			$6,091,800
	ENGINEERING COSTS								$6,091,800
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS					$61,110,409	$3,666,600
	SUB-TOTAL (BASE ESTIMATE)								$101,746,700
32									
33	ESCALATION								
34	RISK BUDGET	24.0%							$24,419,208
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)								$126,165,908
35	CONTINGENCY	15.0%							$15,262,005
	TOTAL ESTIMATED COST INCLUDING CONTINGENCY								$141,427,913
37									

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS & OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4

DATE: 06/21/9

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION AND CIVIL												
	EXCAVATION 220x200x8 = 352000 CF = 13040 CY	13,040	CY	0.25	3260	16.51				$53,823			$53,82
	MISC ALLOWANCE				540	16.51				$8,915			$8,91
	T O T A L				3,800					$62,738			$62,73

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS & OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4
DATE: 02/16/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	CONCRETE												
	GRADE BEAMS 2'WX2'HTX(200+200+220+220)= 336	124	CY	1.00	124	17.56			$58.00	$2,185		$7,218	$9,403
	FORMWORK FOR GRADE BEAMS 2'HTX(200+200+220+220)X2SIDES = 3360 SFCA	3,360	SFCA	0.10	336	17.56			$2.00	$5,900		$6,720	$12,620
	SLAB ON GRADE 220x200X8"= 220X200X.66 = 29040 CF =1075 CY	1086	CY	0.50	543	17.56			$58.00	$9,535		$62,988	$72,523
	EQUIPMENT FOUNDATION TOTAL EXPECTED EQUIPMENTS = 20 EACH PAD IS 20X25X2'DEEP TOTAL CONCRETE= 20PADSX20X25X2 =20000CF =	741	CY	1.00	741	17.56			$58.00	$13,007		$42,963	$55,970
	FORMWORK FOR PADS 20PADSX2'HTX(20+20+25+25) = 3600 SFCA	3600	SFCA	0.25	900	17.56			$2.00	$15,804		$7,200	$23,004
	REINFORCEMENT 150 LBS OF STEEL PER CY OF CONCRETE TOTAL CONCRETE FROM ABOVE=(741+1086+124)= 1951 CY 1951CY X 150LBS STEEL= 292650 LBS = 292650/2000= 147 TONS + 10 % WASTAGE= 147+15= 162 TONS	162	TONS	14.00	2268	17.56			$760.00	$39,826		$123,120	$162,946
	T O T A L CONCRETE									$86,258		$250,209	$336,46[illegible]

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS & OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4

DATE: 02/16/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L.	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	STRUCTURAL STEEL												
	STEEL COLUMNS	70	TONS	30	2,100	19.00			2,200	$39,900		$154,000	$193,900
	BEAMS	20	TONS	30	600	19.00			2,200	$11,400		$44,000	$55,400
	STEEL GIRTS, WIND BRACE ETC	100	TONS	30	3,000	19.00			2,200	$57,000		$220,000	$277,000
	INSULATED METAL SIDING	21000	SF	0.16	3,444	19.00			5.35	$65,436		$112,350	$177,786
	INSULATED METAL ROOF	44000	SF	0.16	7,040	19.00			5.50	$133,760		$242,000	$375,760
	DOORS	12	EA	12	144	19.00			800	$2,736		$9,600	$12,336
	ROLL UP DOORS ELECTRICALLY OPERATED	2	EA	63	126	19.00			3500	$2,394		$7,000	$9,394
	UNDERGROUND UITILITY PIPES ALLOWANCE	1.0	EA	6580	6,580	19.00			125000	$125,020		$125,000	$250,020
	HEATING AND VENTILATING	44000	SF	0.15	6,600	19.00			2.65	$125,400		$116,600	$242,000
	FIRE PROTECTION	44000	SF	0.10	4,400	19.00			2.35	$83,600		$103,400	$187,000
	ROOF DRAINS	700	FT	1	700	19.00			35.00	$13,300		$24,500	$37,800
	MISC ALLOWANCE	1.0	EA	400	400	19.00			4000	$7,600		$4,050	$11,650
	PRODUCTIVITY ALLOWANCE				3,500	19.00				$66,800			$66,800
	TAKE–OFF ALLOWANCE				3,513	19.00				$66,754			$66,754
	TOTAL (STRUCTURAL STEEL)				42147					$801,100		$1,162,500	$1,963,600

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS AND OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4

DATE: 02/16/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MACHINERY & EQUIPMENT												
	Horizontal Conveyor w/ Tripper, 40 wet tons/hr	1	Set	4000	4000	19.75			300000	$79,000		$300,000	$379,000
	Feed Hopper with Vibrating Discharge	3	Ea	3000	9000	19.75			76000	$177,800		$228,000	$405,800
	Sampling System, continuous automatic sampler with 1.5 tons per hour capacity	3	Ea	500	1500	19.75			150000	$29,600		$450,000	$479,600
	Feeder 30 tons/Hr capacity	3	Ea	700	2100	19.75			25000	$41,500		$75,000	$116,500
	Batch Mixers	4	Ea	2000	8000	19.75			625000	$158,000		$2,500,000	$2,658,000
	Additives received and load out station 120 tons/Hr capacity	3	Ea	2000	6000	19.75			300000	$118,500		$900,000	$1,018,500
	Additives storage Hopper, 1500 tons	2	Ea	5400	10800	19.75			120000	$213,300		$240,000	$453,300
	Feeders 5–20 tons/Hr capacity weigh feeder type	2	Ea	400	800	19.75			90000	$15,800		$180,000	$195,800
	Conveyor system 5–25 tons/Hr. capacity belt conveyo	1	Set	3200	3200	19.75			175000	$63,200		$175,000	$238,200
	Stabilized cement load out and transfer System 60 tons /hr. capacity	1	Set	2000	2000	19.75			300000	$39,500		$300,000	$339,500
	Stabilized Cement Placement System 60 tons/hr	1	Set	2000	2000	19.75			280000	$39,500		$280,000	$319,500
	TOTAL (MACH. & EQUIP.)				49400					$975,700		$5,628,000	$6,603,700

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS AND OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4

DATE: 02/16/9

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MACHINERY & EQUIPMENT												
	Equipment operation												
	12 men x 8 hrs x 3 shifts x 250 days yr x 5 yrs	360000	hr	1	360000	19.75				$7,110,000			$7,110,00
					360000					$7,110,000			$7,110,00

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS AND OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4
DATE: 02/16/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	PIPING ALLOWANCE												
	UNDERGROUND WATER PIPING	3,000	LF	0.50	1,500	19.00			20	$28,500		$60,000	$88,500
	BEDDING AND BACKFILL FOR PIPING	3000	LF	1.00	3,000	16.51				$49,530			$49,530
	SEWRER 18"	3000	LF	1.00	3,000	16.51			25	$49,530		$75,000	$124,530
	BEDDING AND BACKFILL FOR SEWER	3000	LF	1.50	4,500	16.51				$74,295			$74,295
	FIRE MAIN 8"	3000	LF	0.60	1,800	19.00			35.00	$34,200		$105,000	$139,200
	BEDDING AND BACKFILL	3,000.0	LF	1.50	4,500	16.51				$74,295			$74,295
	TOTAL PIPING				18300					$310,350		$240,000	$550,350

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS & OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4
DATE: 02/16/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	ELECTRICAL												
	ELECTRICAL SUB STATION ALLOWANCE	1	EA	5000	5,000	18.00			300000	$90,000		$300,000	$390,000
	CONDUITS, WIRING, CONTROL PANELS, SWITCHES ETC. FOR SOLIDIFICATION/CEMENT. EQUIPMENTS ALLOWANCE	1	EA	8000	8,000	18.00			400000	$144,000		$400,000	$544,000
	TOTAL ELECTRICAL				13000					$234,000		$700,000	$934,000

CONTR.NO.–
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS & OPERATION
LOCATION– FERNALD, OHIO
PROJ.CTL.–
W B S # 1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.–
EST. NO. C1–93–9–4
BY: U. Taylor
DATE: 02/16/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	ELECTRICAL POWER USAGE												
	ALLOWANCE OF 1.5 MILLION DOLLARS IS ESTIMATED			REFER	ELECTRICAL	COST ON	SUMMARY						$1,500,000
	TOTAL ELECTRICAL POWER USAGE												$1,500,000

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– CEMENTATION, EQUIPMENTS AND OPERATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4

DATE: 06/21/94

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MATERIALS REQUIRED FOR CEMENTATION PROCESS												
	CEMENT	687,000	TONS						$60.00			$41,220,000	$41,220,000
	FLY ASH	344,000	TONS						$25.00			$8,600,000	$8,600,000
												========	
	This is shown as Cementation Process Additives material for at summary sheet----------											$49,820,000	
												========	
	TOTAL											$49,820,000	$49,820,000

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: D & D - VITRIFICATION
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-5-A
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Upon completion of remedial activities, on-site treatment and support facilities would be decontaminated and dismantled, and the areas occupied by these facilities returned to near-original conditions. This cost component is applicable to Alternative 4A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- All decontamination and dismantlement activities would be implemented following completion of waste excavation/removal, treatment, and disposal.
- An estimated 50,000 square yards (SYs) of asphalt paved access roads, parking lots, ramps, and laydown areas would be decontaminated where appropriate, demolished, and removed.
- An estimated 50,000 SYs of compacted stone access roads, ramps, and laydown areas would be removed.
- An estimated 2,600 cubic yards (CYs) of concrete foundations and footings would be decontaminated where appropriate, demolished, and removed.
- Approximately 25 major pieces of process equipment (includes driers, vitrifiers, off-gas treatment, and material handling) would be decontaminated where appropriate, demolished and removed. All utility lines which serviced the facilities would be removed (electric, sewer, water).
- An estimated 220,000 SYs of disturbed areas would be backfilled, graded, and seeded.
- The labor hours for conducting decontamination and dismantlement operation, based on operating in Level D conditions, was estimated at 63,275 labor hours. Since approximately one third of this work would be performed under Level B conditions, 33

percent of these labor hours were multiplied by a factor of 1.1 and the product added to the original estimated hours. Therefore an estimated 86,244 total labor hours (an additional 22,969 labor hours) would be required to execute the decontamination and dismantlement activities under these modified conditions.

EQUIPMENT RENTAL

- Dismantlement activities would be accomplished with conventional equipment and technologies.

HEALTH PHYSICS

- For cost estimating purposes, Level B personal protective equipment would be required for an estimated 5,500 man days.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-5A

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: FS D & D ONSITE VITRIFICATION

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	86,244		$1,505,980		$20,000	$1,526,000
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		86,244		$1,505,980		$20,000	$1,526,000
11	SUPERVISION - CONTRACTOR				$256,000			$256,000
12	SM TOOLS/CONSM'BLS						$90,400	$90,400
13	EQUIPMENT RENTAL					$1,914,700		$1,914,700
14	TEMP. FACILITIES				$31,600		$58,700	$90,300
15	TEMP UTL'S HOOK-UP				$15,800		$29,400	$45,200
16	JOB CLEAN-UP				$31,600		$58,700	$90,300
17	SAFETY				$15,800		$29,400	$45,200
18	HEALTH PHYSICS						$1,375,000	$1,375,000
	CERCLA	$1,500 PER PERSON				$64,700		$64,700
	BOND					$15,300		$15,300
21	OVERHEAD & PROFIT					$496,200		$496,200
22	PAYRL BRD.&BENFT.				$965,500			$965,500
	INDIRECT FIELD COSTS				$1,316,300	$2,490,900	$1,641,600	$5,448,800
	DIRECT & INDIRECT FIELD COSTS				$2,822,280	$2,490,900	$1,661,600	$6,974,800
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$5,300		$9,900	$15,200
26	PROJ.MGMT-FERMCO				$418,500			$418,500
27	CONSTR MGMT-FERMCO				$488,200			$488,200
	FERMCO FIELD SUPPORT COSTS							$921,900
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$1,185,700
	ENGINEERING COSTS							$1,185,700
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$1,671,500	$100,300
	SUB-TOTAL (BASE ESTIMATE)							$9,182,700
32								
33	ESCALATION							
34	RISK BUDGET	10.0%						$918,270
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$10,100,970
35	CONTINGENCY	8.0%						$734,616
	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$10,835,586
37								

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CONTR.NO.– 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS DEMO D & D ONSITE VITRIFICATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1-93-9-5A
DATE: 02/17/94
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WBS # 1.1.1.1.1.1.3

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SITE DEMOLITION												
	ROADS,PARKING LOTS, ASPHALT PAVEMENT	50000	SY	0.05	2,500	19.59				$48,975			$48,975
	COMPACTED STONE AREAS	50000	SY	0.035	1,750	19.59				$34,283			$34,283
	CONCRETE SLAB ON GRADE & FOUNDATIONS	2600	CY	2.00	5,200	19.59				$101,868			$101,868
	EQUIPMENT DEMO DRYING & VITRIFICATION												
	ASSUME 25 MAJOR PCS.	25	EA	500	12,500	19.00				$237,500			$237,500
	BACKFILL & GRADE AREA	110000	SY	0.05	5,500	16.51				$90,805			$90,805
	STEEL DEMO OF DRYING & VIT FACILITIES	455	TONS	15.00	6,825	16.51				$112,681			$112,681
	STEEL SIDING DEMO	130000	SF	0.10	13,000	16.51				$214,630			$214,630
	BACK FILL & GRADE AREA	110000	SY	0.05	5,500	16.51				$90,805			$90,805
	HYDRO SEED	1,000.0	MSF	0.50	500	16.51			20	$8,255		$20,000	$28,255
	LOAD OUT LABOR ASSUME 10000 HRS	10,000.0	HR	1.00	10,000	16.51				$165,100			$165,100
					63,275					$1,104,901		$20,000	$1,124,901
	ASSUME 33% OF WORK IS CONTAMINATED CONTAMINATED WORK AREA FACTOR @ 2.1 LABOR FACTOR @ ADD OF 1.1 x 33% OF LABOR				22,969					401,079			$401,079
	TOTAL DEMO LABOR/EXCAVATION AND CIVIL				86,244					$1,505,980		$20,000	$1,525,980
	63,275 HRS X 2.1 FACTOR X 33% = SUIT UPS	5500	EA						250			$1,375,000	$1,375,000
	TOTAL HEALTH & PHYSICS											$1,375,000	1375000

CONTR.NO. 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS DEMO D & D ONSITE VITRIFICATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1–93–9–5A

DATE: 02/17/94

WBS # 1.1.1.1.1.1.3

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL												
	CAT 245D SHOVEL	12	MO					20085			$241,020		$241,020
	OPERATING COSTS	2000	HR					47			$94,000		$94,000
	CAT 973D LOADER	12	MO					9175			$110,100		$110,100
	OPERATING COSTS	2000	HR					22			$44,000		$44,000
	CASE 780B	12	MO					4070			$48,840		$48,840
	OPERATING COSTS	2000	HR					12			$24,000		$24,000
	CAT 14G GRADER	6	MO					8310			$49,860		$49,860
	OPERATING COSTS	1000	HR					19			$19,000		$19,000
	CAT D10 TRACTOR	12	MO					27360			$328,320		$328,320
	OPERATING COSTS	2000	HR					70			$140,000		$140,000
	DYNAPAC CC 50A	6	MO					6460			$38,760		$38,760
	OPERATING COSTS	1000	HR					10			$10,000		$10,000
	DUMP TRUCKS ON ROAD	60	MO					3460			$207,600		$207,600
	OPERATING COSTS	10000	HR					12			$120,000		$120,000
	PU TRUCKS	36	MO					450			$16,200		$16,200
	OPERATING COSTS	6000	HR					2			$12,000		$12,000
	WATER TRUCK 5000 GAL	6	MO					3450			$20,700		$20,700
	OPERATING COSTS	1000	HR					13			$13,000		$13,000
	TOOL CARRIER /BREAKER	24	MO					5890			$141,360		$141,360
	OPERATING COSTS	4000	HR					14			$56,000		$56,000
								1500					
								14					
	FLAT BED TRUCK W/HYD CRANE	12	MO					1500			$18,000		$18,000
	OPERATING COSTS	2000	HR					14			$28,000		$28,000
	FORK LIFT R/T	12	MO					5995			$71,940		$71,940
	OPERATING COSTS	2000	HR					17			$34,000		$34,000
	MASTER MECHANIC'S TRUCK	12	MO					1500			$18,000		$18,000
	OPERATING COSTS	2000	HR					5			$10,000		$10,000
	TOTAL EQUIPMENT RENTAL										$1,914,700		$1,914,700

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: D & D - OFF-SITE DISPOSAL
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-5-B
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Upon completion of remedial activities, on-site treatment and support facilities would be decontaminated and dismantled, and the areas occupied by these facilities returned to near-original conditions. This cost component is applicable to Alternatives 5A and 5B. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- All decontamination and dismantlement activities would be implemented following completion of waste excavation/removal, treatment, and disposal.
- An estimated 50,000 square yards (SYs) of asphalt paved access roads, parking lots, ramps, and laydown areas would be decontaminated where appropriate, demolished, and removed.
- An estimated 50,000 SYs of compacted stone access roads, ramps, and laydown areas would be removed.
- An estimated 2,600 cubic yards (CYs) of concrete foundations and footings would be decontaminated where appropriate, demolished, and removed.
- Approximately 12 major pieces of process equipment (includes dryers, off-gas treatment, and material handling) would be decontaminated where appropriate, demolished and removed. All utility lines which serviced the facilities would be removed (electric, sewer, water).
- An estimated 80,000 SYs of disturbed areas would be backfilled, graded, and seeded.
- The labor hours for conducting decontamination and dismantlement operation, based on operating in Level D conditions, was estimated at 46,000 labor hours. Since approximately one third of this work would be performed under Level B conditions, 33

percent of these labor hours were multiplied by a factor of 1.1 and the product added to the original estimated hours. Therefore an estimted 62,698 total labor hours (an additional 16,698 labor hours) would be required to execute the decontamination and dismantlement activities under these modified conditions.

EQUIPMENT RENTAL

- Dismantlement activities would be accomplished with conventional equipment and technologies.

HEALTH PHYSICS

- For cost estimating purposes, Level B personal protective equipment would be required for an estimated 3,985 man days.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-5B

CLIENT: US DOE

PROJECT TITLE: FS D & D OffSITE DISPOSAL

FERMCO ESTIMATING SERVICES

SUMMARY SHEET

DATE: 26-Feb-94

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	62,698		$1,098,628		$20,000	$1,118,600
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**62,698**		**$1,098,628**		**$20,000**	**$1,118,600**
11	SUPERVISION - CONTRACTOR				$187,000			$187,000
12	SM TOOLS/CONSM'BLS						$65,900	$65,900
13	EQUIPMENT RENTAL					$1,352,490		$1,352,500
14	TEMP. FACILITIES				$23,100		$42,800	$65,900
15	TEMP UTL'S HOOK-UP				$11,500		$21,400	$32,900
16	JOB CLEAN-UP				$23,100		$42,800	$65,900
17	SAFETY				$11,500		$21,400	$32,900
18	HEALTH PHYSICS						$996,250	$996,250
19	CERCLA	$1,500 PER PERSON				$47,000		$47,0[illegible]
20	BOND					$11,200		$11,[illegible]
21	OVERHEAD & PROFIT					$357,800		$357,800
22	PAYRL BRD.&BENFT.				$704,500			$704,500
	INDIRECT FIELD COSTS				**$960,700**	**$1,768,490**	**$1,190,550**	**$3,919,750**
	DIRECT & INDIRECT FIELD COSTS				**$2,059,328**	**$1,768,490**	**$1,210,550**	**$5,038,350**
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$3,900		$7,300	$11,200
26	PROJ.MGMT-FERMCO				$302,300			$302,300
27	CONSTR MGMT-FERMCO				$352,700			$352,700
	FERMCO FIELD SUPPORT COSTS							**$666,200**
28								
29								
30	ENGINEERING	**TITLE I**	**TITLE II**		**TITLE III**			$856,500
	ENGINEERING COSTS							**$856,500**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$1,217,850	$73,100
	SUB-TOTAL (BASE ESTIMATE)							**$6,634,150**
32								
33	ESCALATION							
34	RISK BUDGET	10.0%						$663,415
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$7,297,565**
35	CONTINGENCY	8.0%						$530,7[illegible]
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**							**$7,828,[illegible]**
37								

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CONTR.NO.- 24321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS DEMO D & D OFFSITE DISPOSAL
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-5B

DATE: 02/17/94
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WBS # 1.1.1.1.1.1.3

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SITE DEMOLITION												
	ROADS,PARKING LOTS, ASPHALT PAVEMENT	50000	SY	0.05	2,500	19.59				$48,975			$48,975
	COMPACTED STONE AREAS	50000	SY	0.035	1,750	19.59				$34,283			$34,283
	CONCRETE SLAB ON GRADE & FOUNDATIONS	2600	CY	2.00	5,200	19.59				$101,868			$101,868
	RAIL ROAD RAIL & TIES	2200	LF	0.50	1,100	16.51				$18,161			$18,161
	DEMO SILOS	4	EA	*******	800	19.00				$15,200			$15,200
	RAIL ROAD SPUR BEDDING	5000	SY	0.04	175	19.59				$3,428			$3,428
	EQUIPMENT DEMO DRYING												
	ASSUME 12 MAJOR PCS.	12	EA	500	6,000	19.00				$114,000			$114,000
	BACKFILL & GRADE AREA	110000	SY	0.05	5,500	16.51				$90,805			$90,805
	STEEL DEMO OF DRYING	265	TONS	15.00	3,975	16.51				$65,627			$65,627
	STEEL SIDING DEMO	65000	SF	0.10	6,500	16.51				$107,315			$107,315
	BACK FILL & GRADE AREA	80000	SY	0.05	4,000	16.51				$66,040			$66,040
	HYDRO SEED	1000	MSF	0.50	500	16.51			20	$8,255		$20,000	$28,255
	LOAD OUT LABOR ASSUME 8000 HRS	8000	HR	1.00	8,000	16.51				$132,080			$132,080
					46,000					$806,037		$20,000	$826,037
	ASSUME 33% OF WORK IS CONTAMINATED CONTAMINATED WORK AREA FACTOR @ 2.1 LABOR FACTOR @ ADD OF 1.1 x 33% OF LABOR				16,698					292,591			$292,591
	TOTAL				62,698					$1,098,628		$20,000	$1,118,628
	SUIT UPS ASSUME 5700 MAN DAYS x 33% = 46000 HRS X 33% = 15180 X 2.1 =31878 / 8 = 3985 DAYS	3985	EA						250			$996,250	$996,250
	TOTAL SUIT UPS											$996,250	$996,250

E-I-93

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6097

CONTR.NO.– 4424321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS DEMO D & D OFFSITE DISPOSAL
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1-93-9-5B

DATE: 02/17/94

WBS # 1.1.1.1.1.1.3

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	EQUIPMENT RENTAL												
	CAT 245D SHOVEL	9	MO					20085			$180,765		$180,765
	OPERATING COSTS	1500	HR					47			$70,500		$70,500
	CAT 973D LOADER	9	MO					9175			$82,575		$82,575
	OPERATING COSTS	1500	HR					22			$33,000		$33,000
	CASE 780B	9	MO					4070			$36,630		$36,630
	OPERATING COSTS	1500	HR					12			$18,000		$18,000
	CAT 14G GRADER	6	MO					8310			$49,860		$49,860
	OPERATING COSTS	1000	HR					19			$19,000		$19,000
	CAT D10 TRACTOR	9	MO					27360			$246,240		$246,240
	OPERATING COSTS	1500	HR					70			$105,000		$105,000
	DYNAPAC CC 50A	6	MO					6460			$38,760		$38,760
	OPERATING COSTS	1000	HR					10			$10,000		$10,000
	DUMP TRUCKS ON ROAD	24	MO					3460			$83,040		$83,040
	OPERATING COSTS	4000	HR					12			$48,000		$48,000
	PU TRUCKS	24	MO					450			$10,800		$10,800
	OPERATING COSTS	4000	HR					2			$8,000		$8,000
	WATER TRUCK 5000 GAL	6	MO					3450			$20,700		$20,700
	OPERATING COSTS	1000	HR					13			$13,000		$13,000
	OFF ROAD DUMP TRUCK CAT 25D	12	MO					5890			$70,680		$70,680
	OPERATING COSTS	2000	HR					14			$28,000		$28,000
								1500					
								14					
	FLAT BED TRUCK W/HYD CRANE	12	MO					1500			$18,000		$18,000
	OPERATING COSTS	2000	HR					14			$28,000		$28,000
	FORK LIFT R/T	12	MO					5995			$71,940		$71,940
	OPERATING COSTS	2000	HR					17			$34,000		$34,000
	MASTER MECHANIC'S TRUCK	12	MO					1500			$18,000		$18,000
	OPERATING COSTS	2000	HR					5			$10,000		$10,000
											$1,352,490		$1,352,490

000113

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: D & D - CEMENTATION
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-5-C
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Upon completion of remedial activities, on-site treatment and support facilities would be decontaminated and dismantled, and the areas occupied by these facilities returned to near-original conditions. This cost component is applicable to Alternative 4B only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- All decontamination and dismantlement activities would be implemented following completion of waste excavation/removal, treatment, and disposal.
- An estimated 50,000 square yards (SYs) of asphalt paved access roads, parking lots, ramps, and laydown areas would be decontaminated where appropriate, demolished, and removed.
- An estimated 50,000 SYs of compacted stone access roads, ramps, and laydown areas would be removed.
- An estimated 2,600 cubic yards (CYs) of concrete foundations and footings would be decontaminated where appropriate, demolished, and removed.
- Approximately 12 major pieces of process equipment (includes dryers, off-gas treatment, cementation-solidification, and material handling) would be decontaminated where appropriate, demolished and removed. All utility lines which serviced the facilities would be removed (electric, sewer, water).
- An estimated 80,000 SYs of disturbed areas would be backfilled, graded, and seeded.
- The labor hours for conducting decontamination and dismantlement operation, based on operating in Level D conditions, was estimated to be 45,925 labor hours. Since approximately one third of this work would be performed under Level B conditions, 33

percent of these labor hours were multiplied by a factor of 1.1 and the product added to the original estimated hours. Therefore an estimted 62,596 total labor hours (an additional 16,671 labor hours) would be required to execute the decontamination and dismantlement activities under these modified conditions.

EQUIPMENT RENTAL

- Dismantlement activities would be accomplished with conventional equipment and technologies.

HEALTH PHYSICS

- For cost estimating purposes, Level B personal protective equipment would be required for an estimated 3,985 man days.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-5C

CLIENT: US DOE

PROJECT TITLE: FS D & D CEMENTATION

FERMCO ESTIMATING SERVICES

SUMMARY SHEET

DATE: 26-Feb-94

6097

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	62,698		$1,098,628		$20,000	$1,118,600
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		62,698		$1,098,628		$20,000	$1,118,600
11	SUPERVISION - CONTRACTOR				$186,800			$186,800
12	SM TOOLS/CONSM'BLS						$65,900	$65,900
13	EQUIPMENT RENTAL					$1,352,490		$1,352,500
14	TEMP. FACILITIES				$23,100		$42,800	$65,900
15	TEMP UTL'S HOOK-UP				$11,500		$21,400	$32,900
16	JOB CLEAN-UP				$23,100		$42,800	$65,900
17	SAFETY				$11,500		$21,400	$32,900
18	HEALTH PHYSICS						$996,250	$996,250
	CERCLA	$1,500 PER PERSON				$47,000		$47,000
	BOND					$11,200		$11,200
21	OVERHEAD & PROFIT					$357,800		$357,800
22	PAYRL BRD.&BENFT.				$704,400			$704,400
	INDIRECT FIELD COSTS				$960,400	$1,768,490	$1,190,550	$3,919,450
	DIRECT & INDIRECT FIELD COSTS				$2,059,028	$1,768,490	$1,210,550	$5,038,050
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$3,900		$7,300	$11,200
26	PROJ.MGMT-FERMCO				$302,300			$302,300
27	CONSTR MGMT-FERMCO				$352,700			$352,700
	FERMCO FIELD SUPPORT COSTS							$666,200
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$856,500
	ENGINEERING COSTS							$856,500
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$1,217,850	$73,100
	SUB-TOTAL (BASE ESTIMATE)							$6,633,850
32								
33	ESCALATION							
34	RISK BUDGET	10.0%						$663,385
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$7,297,235
35	CONTINGENCY	8.0%						$530,708
	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$7,827,943
37								

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS DEMO D & D OFFSITE DISPOSAL
LOCATION- FERNALD, OHIO

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-5B

DATE: 02/17/94
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WBS # 1.1.1.1.1.1.3

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SITE DEMOLITION												
	ROADS,PARKING LOTS, ASPHALT PAVEMENT	50000	SY	0.05	2,500	19.59				$48,975			$48,975
	COMPACTED STONE AREAS	50000	SY	0.035	1,750	19.59				$34,283			$34,283
	CONCRETE SLAB ON GRADE & FOUNDATIONS	2600	CY	2.00	5,200	19.59				$101,868			$101,868
	RAIL ROAD RAIL & TIES	2200	LF	0.50	1,100	16.51				$18,161			$18,161
	DEMO SILOS	4	EA	*******	800	19.00				$15,200			$15,200
	RAIL ROAD SPUR BEDDING	5000	SY	0.04	175	19.59				$3,428			$3,428
	EQUIPMENT DEMO DRYING ASSUME 12 MAJOR PCS.	12	EA	500	6,000	19.00				$114,000			$114,000
	BACKFILL & GRADE AREA	110000	SY	0.05	5,500	16.51				$90,805			$90,805
	STEEL DEMO OF DRYING	265	TONS	15.00	3,975	16.51				$65,627			$65,627
	STEEL SIDING DEMO	65000	SF	0.10	6,500	16.51				$107,315			$107,315
	BACK FILL & GRADE AREA	80000	SY	0.05	4,000	16.51				$66,040			$66,040
	HYDRO SEED	1000	MSF	0.50	500	16.51			20	$8,255		$20,000	$28,255
	LOAD OUT LABOR ASSUME 8000 HRS	8000	HR	1.00	8,000	16.51				$132,080			$132,080
					46,000					$806,037		$20,000	$826,037
	ASSUME 33% OF WORK IS CONTAMINATED CONTAMINATED WORK AREA FACTOR @ 2.1 LABOR FACTOR @ ADD OF 1.1 x 33% OF LABOR				16,698					292,591			$292,591
	TOTAL				62,698					$1,098,628		$20,000	$1,118,628
	SUIT UPS ASSUME 46000 HRS X 33% = 15180 X 2.1 =31878 / 8 = 3985 DAYS	3985	EA						250			$996,250	$996,250
	TOTAL HEALTH & PHYSICS											$996,250	$996,250

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS DEMO D & D CEMENTATION
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-5C
BY: D. HOPP
DATE: 02/17/94

WBS # 1.1.1.1.1.1.3

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	EQUIPMENT RENTAL												
	CAT 245D SHOVEL	9	MO					20085			$180,765		$180,765
	OPERATING COSTS	1500	HR					47			$70,500		$70,500
	CAT 973D LOADER	9	MO					9175			$82,575		$82,575
	OPERATING COSTS	1500	HR					22			$33,000		$33,000
	CASE 780B	9	MO					4070			$36,630		$36,630
	OPERATING COSTS	1500	HR					12			$18,000		$18,000
	CAT 14G GRADER	6	MO					8310			$49,860		$49,860
	OPERATING COSTS	1000	HR					19			$19,000		$19,000
	CAT D10 TRACTOR	9	MO					27360			$246,240		$246,240
	OPERATING COSTS	1500	HR					70			$105,000		$105,000
	DYNAPAC CC 50A	6	MO					6460			$38,760		$38,760
	OPERATING COSTS	1000	HR					10			$10,000		$10,000
	DUMP TRUCKS ON ROAD	24	MO					3460			$83,040		$83,040
	OPERATING COSTS	4000	HR					12			$48,000		$48,000
	PU TRUCKS	24	MO					450			$10,800		$10,800
	OPERATING COSTS	4000	HR					2			$8,000		$8,000
	WATER TRUCK 5000 GAL	6	MO					3450			$20,700		$20,700
	OPERATING COSTS	1000	HR					13			$13,000		$13,000
	OFF ROAD DUMP TRUCK CAT 25D	12	MO					5890			$70,680		$70,680
	OPERATING COSTS	2000	HR					14			$28,000		$28,000
								1500					
								14					
	FLAT BED TRUCK W/HYD CRANE	12	MO					1500			$18,000		$18,000
	OPERATING COSTS	2000	HR					14			$28,000		$28,000
	FORK LIFT R/T	12	MO					5995			$71,940		$71,940
	OPERATING COSTS	2000	HR					17			$34,000		$34,000
	MASTER MECHANIC'S TRUCK	12	MO					1500			$18,000		$18,000
	OPERATING COSTS	2000	HR					5			$10,000		$10,000
											$1,352,490		$1,352,490

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: SHIPPING AND DISPOSAL - NEVADA TEST SITE
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-4-A
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

For disposal at the Nevada Test Site (NTS) the treated waste would be directly loaded into shipping containers. The shipping containers would then be placed onto flatbed-type railcars for shipment to Las Vegas, Nevada. Upon arrival in Las Vegas, the shipping containers would be off-loaded onto trucks for final transport to NTS. An estimated 1,053,300 wet tons (15 percent moisture) of treated waste would be offered for shipment and disposal. This cost component is applicable to Alternative 5A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Prior to waste loadout, each shipping container would be visually inspected for damage. Damaged shipping containers would either be repaired or rejected. Following inspection, the shipping containers would be loaded with treated waste and sealed shut.

WASTE CONSTRUCTION MANAGEMENT

- Following loadout, each shipping container would be surveyed for radiological contaminants, decontaminated if necessary, and certified for release from the project site.

EQUIPMENT RENTAL

- Shipping containers would be loaded onto railcars for transport to Las Vegas, Nevada. Upon arrival in Las Vegas, Nevada, the shipping containers would be transferred from the railcars to flatbed trucks for the final leg of the trip to NTS.

WASTE CONTAINERS

- Approximately 1,053,300 wet tons of treated waste would be offered for shipment and disposal. The treated waste would be transported in 15 cubic yard (CY) shipping containers. Based on each shipping container holding approximately 20 moist tons of treated waste, and estimated 52,665 containers would be required for the expected waste volume.

TRANSPORTATION AND BURIAL

- An estimated 17,555 railcar shipments would be required for the expected waste volume (based on 3 shipping containers per rail car). One-way mileage for the preferred route to NTS is estimated at 2,307 miles by rail and 60 miles by highway.

SOIL/WATER/AIR

- In order to assess whether or not the treated waste offered for disposal is within the limits of the disposal facilities license, samples of the treated waste would be collected at predetermined frequencies and submitted for select analyses. For the purpose of this cost estimate, approximately 1,054 samples (one sample per 1,000 tons of waste offered for disposal) would be collected and submitted for paint filter, TCLP, radiological, and general chemistry analyses.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-4B

CLIENT: US DOE

PROJECT TITLE: SHIPPING AND DISPOSAL NTS

FERMCO ESTIMATING SERVICES

SUMMARY SHEET

DATE: 26-Feb-94

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	145,600		$2,527,824			$2,527,8[illegible]
		WASTE CONSTRUCTION MGMT LABOR	166,400		$3,452,800			$3,452,800
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**312,000**		**$5,980,624**			**$5,980,600**
11	SUPERVISION - CONTRACTOR				$1,016,700			$1,016,700
12	SM TOOLS/CONSM'BLS						$358,800	$358,800
13	EQUIPMENT RENTAL					$1,944,600		$1,944,600
14	TEMP. FACILITIES				$125,600		$233,200	$358,800
15	TEMP UTL'S HOOK-UP				$62,800		$116,600	$179,400
16	JOB CLEAN-UP				$125,600		$233,200	$358,800
17	SAFETY				$62,800		$116,600	$179,400
18	HEALTH PHYSICS				$1,474,800			$1,474,800
19	CERCLA	$1,500 PER PERSON				$234,000		$234,000
20	BOND					$59,800		$5[illegible]
21	OVERHEAD & PROFIT					$1,093,100		$1,093,1[illegible]
22	PAYRL BRD.&BENFT.				$4,601,400			$4,601,400
	INDIRECT FIELD COSTS				**$7,469,700**	**$3,331,500**	**$1,058,400**	**$11,859,600**
	DIRECT & INDIRECT FIELD COSTS				**$13,450,324**	**$3,331,500**	**$1,058,400**	**$17,840,200**
23	TRANSPORTATION & BURIAL					$329,156,250		$329,156,250
24	WASTE CONTAINERS						$184,327,500	$184,327,500
25	SOIL/WATER/AIR					$6,150,090		$6,150,090
26	PROJ.MGMT-FERMCO				$1,070,400			$1,070,400
27	CONSTR MGMT-FERMCO				$1,248,800			$1,248,800
	FERMCO FIELD SUPPORT COSTS							**$521,953,040**
28								
29								
30	ENGINEERING	**TITLE I**	**TITLE II**		**TITLE III**			$3,032,800
	ENGINEERING COSTS							**$3,032,800**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$185,385,900	$11,123,200
	SUB-TOTAL (BASE ESTIMATE)							**$553,949,240**
32								
33	ESCALATION							
34	RISK BUDGET	11.0%						$60,934,416
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$614,883,656**
35	CONTINGENCY	9.0%						$49,855,432
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**							**$664,73[illegible]**
37								

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL NTS
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4A

DATE: 02/18/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	Assumptions 1,053,300 TONS of waste material to be shipped to NTS during five year of period. ABOUT 20TON/21 TON BOXES TRUCK LOAD LIMIT IS 21 TON THE BOX WEIGHT 1 TON + 20 TON MATERIAL IN BOX COST OF CONTAINERS ========== 20 tons Container 1053300 Tons/ 20 = 52665 containers	52665	EA						3500			$184,327,500	$184,327,500
	TOTAL WASTE CONTAINERS											$184,327,500	$184,327,500
	COST OF TRANSPORTATION AND BURIAL ========== Rail Box Car Flat rate per container	52665	EA					1850			$97,430,250		$97,430,250
	Transporting containers from Las Vegas to NTS by trucks , cost is per container	52665	EA					400			$21,066,000		$21,066,000
	Disposal cost of waste material at NTS So per ton = 2000 lbs X$ .10 =$ 200	1,053,300	TON					200			$210,660,000		$210,660,000
	Disposal cost $10 / cf one cubic ft material weighs 100 lbs. So disposal cost per lb = $10/100 = $ .10												
	TOTAL TRANSPORTATION & BURIAL										$329,156,250		$329,156,250

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL NTS
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4A
DATE: 02/18/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL												
	Crane to load container in railcar at site Model # RT–755, 55 tons crane)	60	MO					10925			655,500		655,500
	Crane to unload container at Las Vegas from Railcar and load on to trucks Model # RT–755, 55 tons crane)	60	MO					10925			655,500		655,500
	Operating cost per hr. for crane 120 months x 160 hrs = 19200 Hrs.	19200	HR					33			633,600		633,600
	TOTAL EQUIPMENT RENTAL										$1,944,600		$1,944,600

CLIENT– U. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL NTS
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4A

DATE: 02/18/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	WASTE CONST. MANAGEMENT												
	WASTE CONST. MANAGERS 2 MANAGERS x 40HRS x 52 WKS x 5 YRS = 20,800 HR	20800	HR	1	20800	38.13				$793,104			$793,104
	WASTE.CONST. ENGR. 2 ENGINEERS x 40HRS x 52 WKS x 5 YRS = 20,800 HR	20800	HR	1	20800	27.41				$570,128			$570,128
	WASTE.CONST. TECHNICIAN 4 TECHNICIAN x 40HRS x 52 WKS x 5 YRS = 41,600 HR	41600	HR	1	41600	19.49				$810,784			$810,784
	WASTE.CONST. LABORS 8 LABORS x 40HRS x 52 WKS x 5 YRS = 83,200 HRS	83200	HR	1	83200	15.37				$1,278,784			$1,278,784
	WASTE CONSTRUCTION MGMT				********					3,452,800			3,452,800

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL NTS
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4A
DATE: 02/18/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	ANALYTICAL TESTS												
	TCLP	1054	EA					1400			$1,475,600		$1,475,600
	PAINT FILTER	1054	EA					19			$20,026		$20,026
	RADIOLOGICAL	1054	EA					3101			$3,268,454		$3,268,454
	GENERAL CHEMISTRY	1054	EA					1315			$1,386,010		$1,386,010
	TOTAL SOIL/WATER/AIR										$6,150,090		$6,150,090

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL NTS
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1–93–9–4A

DATE: 02/18/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	LABORS TO OPERATE CRANES ETC.												
	Labor Crew of 5 as explained below												
	Operator 2, Total hrs = 2*40 hrs*52wks*5 yrs=	20800	HR		20800	19.49				$405,392			$405,392
	Oiler 2 , total hrs= 2*40hrs*52 wks* 5 yrs=	20800	HR		20800	19.49				$405,392			$405,392
	Labor 10, total hrs= 10*40 hrs* 52 wks * 5 yrs	104000	HR		104000	16.51				$1,717,040			$1,717,040
	TOTAL EXCAVATION AND CIVIL				145600					$2,527,824			$2,527,824

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: SHIPPING AND DISPOSAL: PERMITTED COMMERCIAL DISPOSAL FACILITY
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-4-B
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

For disposal at the representative permitted commercial disposal facility near Clive, Utah the treated waste would be unloaded from the operational storage silos directly into gondola-type railcars. Disposable reinforced polyethylene liners would be placed in the empty rail cars prior to waste loadout. The liners would have a lap-over top that would be laced shut after the railcar is filled with treated waste. The loaded railcars would be transported directly to the disposal facility near Clive, Utah, where the treated waste would be unloaded and placed in a disposal cell. An estimated 1,053,300 wet tons (15 percent moisture on a dry basis) of treated waste would be offered for shipment and disposal. This cost component is applicable to Alternative 5B only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Prior to placement of the polyethylene liner and waste loadout, each railcar would be visually inspected for areas which may jeopardize the integrity of the liner during shipment. Minor repairs will be made to the railcars if necessary. Following inspection the polyethylene liner would be positioned in the railcar, loaded with treated waste, and laced shut.

WASTE CONSTRUCTION MANAGEMENT

- Following waste loadout, each railcar would be surveyed for radiological contaminants, decontaminated if necessary, and certified for release from the project site.

WASTE CONTAINERS

- Approximately 14,044 polyethylene gondola railcar liners would be required.

TRANSPORTATION AND BURIAL

- Approximately 14,044 gondola railcar shipments at 75 wet tons each would be required to transport the treated waste from the project site to the disposal facility near Clive, Utah. Railcars would be transported directly to the disposal facility. One-way mileage for the preferred route to disposal facility is estimated at 1,913 miles.

SOIL/WATER/AIR

- In order to assess whether or not the treated waste offered for disposal is within the limits of the disposal facilities license, samples of the treated waste would be collected at predetermined frequencies and submitted for select analyses. For the purpose of this cost estimate, approximately 1,054 samples (one sample per 1,000 tons of waste offered for disposal) would be collected and submitted for paint filter, TCLP, and general chemistry analyses. An additional 2,108 samples (one sample per 500 tons of waste offered for disposal) would be collected and submitted for radiological analyses.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-9-4B

FERMCO ESTIMATING SERVICES

DATE: 21-Jun-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: SHIPPING AND DISPOSAL, ENVIROCARE

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	52,000		$858,520			$858,500
		WASTE CONSTRUCTION MGMT LABOR	83,200		$1,726,400			$1,726,400
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9		PAINTING AND SCAFFOLD						
10		INSULATION						
	DIRECT FIELD COSTS		**135,200**		**$2,584,920**			**$2,584,900**
11	SUPERVISION - CONTRACTOR				$439,400			$439,400
12	SM TOOLS/CONSM'BLS						$155,100	$155,100
13	EQUIPMENT RENTAL						$473,200	$473,200
14	TEMP. FACILITIES				$54,300		$100,800	$155,100
15	TEMP UTL'S HOOK-UP				$27,100		$50,400	$77,500
16	JOB CLEAN-UP				$54,300		$100,800	$155,100
17	SAFETY				$27,100		$50,400	$77,500
18	HEALTH PHYSICS S/C				$637,400			$637,400
19	CERCLA	$1,500 PER PERSON				$101,400		$101,400
20	BOND					$25,800		$25,800
21	OVERHEAD & PROFIT					$439,400		$439,400
22	PAYRL BRD.&BENFT.				$1,988,800			$1,988,800
	INDIRECT FIELD COSTS				**$3,228,400**	**$566,600**	**$930,700**	**$4,725,700**
	DIRECT & INDIRECT FIELD COSTS				**$5,813,320**	**$566,600**	**$930,700**	**$7,310,600**
23	TRANSPORTATION & BURIAL					$236,641,400		$236,641,400
24	WASTE CONTAINERS						$5,617,600	$5,617,600
25	SOIL/WATER/AIR					$9,418,544		$9,418,544
26	PROJ.MGMT-FERMCO				$438,600			$438,600
27	CONSTR MGMT-FERMCO				$511,700			$511,700
	FERMCO FIELD SUPPORT COSTS				**$950,300**	**$246,059,944**	**$5,617,600**	**$252,627,844**
28	EMISSION MODELING							
29	PSAR/FSAR(SAFETY RPT)							
30	ENGINEERING	**TITLE I**	**TITLE II**		**TITLE III**			$1,242,800
	ENGINEERING COSTS							**$1,242,800**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$6,548,300	$392,900
	SUB-TOTAL	**(BASE ESTIMATE)**						**$261,574,144**
32	G&A-FERMCO	**(SEE EXCLUSION COMMENTS)**						
33	ESCALATION	**(SEE EXCLUSION COMMENTS)**						
34	RISK BUDGET	11.0%						$28,773,156
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$290,347,300**
35	CONTINGENCY	12.0%						$31,388,897
	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$321,736,197
36								
37								

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CLIENT– U.S. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL : COMMERCIAL DISPOSAL FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4B
DATE: 06/21/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	Assumptions 1,053,300 TONS of waste material to be shipped to Envirocare during five year of period.												
	75 tons Gondala Liner TOTAL WASTE CONTAINERS	14044	EA						400			$5,617,600	$5,617,600
	Bulk transport – Gondola railcar dumper	14044	EA					4850			$68,113,400		$68,113,400
	Disposal cost of waste material at Envirocare Disposal cost per cf is $ 8.00 One cubic foot material weighs 100 lbs. So cost of disposal per lb is 8.00/100 = .08 PER TON = 2000 LBx$.08= $160.00	1,053,300	TON					160			$168,528,000		$168,528,000
	TOTAL TRANSPORTATION & BURIAL										$236,641,400		$236,641,400
	5 LABORS CREW FOR OPERATION OF HANDLING MATERIAL LOADING IN RAILCAR DUMPER. 5 LABOR*40 HRS.*52 WEEKS* 5YRS = 52000 HRS.	52000	HR			16.51				$858,520			$858,520
	TOTAL EXCAVATION AND CIVIL									858,520			$858,520

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL : COMMERCIAL DISPOSAL FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4B

DATE: 06/21/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	WASTE CONSTRUCTION MANAGEMENT												
	WASTE CONST.MANAGER 1 MANAGER x 40 HRS x 52 WEEKS x 5 YRS. = 10,400	10400	HR	1	10400	38.13				$396,552			$396,552
	WASTE CONST.ENGINEER 1 ENGR. x 40 HRS x 52 WEEKS x 5 YRS. = 10,400 HRS	10400	HR	1	10400	27.41				$285,064			$285,064
	WASTE CONST.TECHNICIAN 2 TECH. x 40 HRS x 52 WEEKS x 5 YRS. = 20,800 HRS	20800	HR	1	20800	19.49				$405,392			$405,392
	WASTE CONST. LABORS 4 LABOR x 40 HRS x 52 WEEKS x 5 YRS. = 41,600 HRS	41600	HR	1	41600	15.37				$639,392			$639,392
		83200								$1,726,400			$1,726,400

CLIENT– U.S. DEPT. OF ENERGY
PROJECT– SHIPPING AND DISPOSAL : COMMERCIAL DISPOSAL FACILITY
LOCATION– FERNALD, OHIO

BUDGET ESTIMATE DETAILS

EST. NO. C1-93-9-4B

DATE: 06/21/94

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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS			COST/UNIT			LABOR	SUB CONTRACT	MATERIAL	TOTAL
				UNIT	TOTAL	RATE	LABOR	SUB	MAT'L				
	ANALYTICAL TESTS												
	RADIOLOGICAL	2108	EA					3101			$6,536,908		$6,536,908
	TCLP	1054	EA					1400			$1,475,600		$1,475,600
	PAINT FILTER	1054	EA					19			$20,026		$20,026
	GENERAL CHEMISTRY	1054	EA					1315			$1,386,010		$1,386,010
	TOTAL										$9,418,544		$9,418,544

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: ON-SITE DISPOSAL CELL FOR CEMENTATION
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-1-A
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Approximately 1,300,000 cubic yards (CYs) of cement-stabilized waste would be placed within an on-site disposal cell. The disposal cell would be constructed above grade in four equal phases and have a square footprint of approximately 79 acres. Placement of cement-solidified waste within the cell would occur over the 5-year processing/treatment period. This cost component is applicable to Alternative 4B only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- The proposed disposal cell is sited in the northeast corner of the OU3 process area. Clearing and grubbing, removal of existing underground piping and foundations, and excavation of associated contaminated soils within this area would be performed by OU3.

- Approximately 186,000 square yards (SYs) of material would be cleared and grubbed along the east, north, and west sides of the disposal cell in preparation for construction of a channel designed to protect the cell from the Probable Maximum Flood.

- The disposal cell liner would incorporate (descending from top to bottom) the following:

  - 24-inch thick protective layer of uniform soil or flyash;
  - 6-inch thick sand filter;
  - 18-inch thick gravel leachate collection system;
  - primary liner of a geomembrane and geosynthetic clay;
  - 6-inch thick secondary sand filter;
  - 18-inch thick secondary leachate collection system;
  - secondary geomembrane and geosynthetic clay liner; and
  - 36-inch thick clay liner.

- Material utilized in the construction of the disposal cell foundation, liners, cap, side slope protection, and surface water diversion channels would be purchased from a local vendor and include gravel, clayey soils, sand, common fill, topsoil, and rip rap.

- Following placement of the cement-stabilized waste, a disposal cell cover would be installed. The cover would incorporate (descending from top to bottom) the following:

  - 33-inch thick vegetative layer;
  - 6-inch thick gravel filter;
  - 36-inch thick biotic barrier of cobbles;
  - 12-inch thick sand drainage layer;
  - double layer of high density polyethylene and geosynthetic clay liner; and
  - 24-inch thick clay layer;
  - 18-inch thick contouring fill layer.

- Cement-stabilized waste would be transported from the treatment facility to the disposal cell through an enclosed conveyor system (approximately 2,500 feet in length). The cement-stabilized waste would be placed in the disposal cell approximately over a 5-year period. Distribution of the waste within the disposal cell would be accomplished using the conveyor system and conventional earth moving equipment.

- Interim covers would be placed on all exposed waste before the final cover is in place. A tarp would be used as an interim cover for waste exposed on a daily basis and clean fill would be used for waste exposed for a week or longer. During placement, temporary berms and diversion ditches would be used to protect the waste from overland flow.

- Eight groundwater monitoring wells, each approximately 50-feet deep, would be installed for the purpose of monitoring the performance of the disposal facility.

PIPING

- Leachate from the exposed and capped treated waste would be collected by a permanent leachate collection system. An allowance for installation of the leachate collection system has been provided.

EQUIPMENT RENTAL

- Construction of the disposal cell would be accomplished with conventional earth moving equipment.

SOIL/WATER/AIR

- In order to assess whether or not the treated waste offered for disposal is within the waste acceptance criteria of the disposal cell, samples of the treated waste would be collected and analyzed by TCLP. For costing purposes, one sample would be collected and submitted for analysis for every 500 CY of treated waste offered for disposal. The frequency of testing required to ensure product quality during the remedial effort would be established during start-up testing of the treatment system.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

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EST FILE #: C1-93-9-1A

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: ON-SITE STORAGE CELL: CEMENTATION

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	2,048,269		$34,470,987	$134,800	$18,551,130	$53,156,900
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING	7,080		$134,100		$100,300	$234,400
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		2,055,349		$34,605,087	$134,800	$18,651,430	$53,391,300
11	SUPERVISION - CONTRACTOR				$5,882,900			$5,882,900
12	SM TOOLS/CONSM'BLS						$2,076,300	$2,076,300
13	EQUIPMENT RENTAL					$7,130,700		$7,130,700
14	TEMP. FACILITIES				$726,700		$1,349,600	$2,076,300
15	TEMP UTL'S HOOK-UP				$363,400		$674,800	$1,038,200
16	JOB CLEAN-UP				$726,700		$1,349,600	$2,076,300
17	SAFETY				$363,400		$674,800	$1,038,200
18	HEALTH PHYSICS S/C				$8,533,600			$8,533,600
	CERCLA	$1,500 PER PERSON				$1,541,500		$1,541,500
	BOND					$533,900		$533,900
21	OVERHEAD & PROFIT					$7,678,700		$7,678,700
22	PAYRL BRD.&BENFT.				$26,624,900			$26,624,900
	INDIRECT FIELD COSTS				$43,221,600	$16,884,800	$6,125,100	$66,231,500
	DIRECT & INDIRECT FIELD COSTS				$77,826,687	$17,019,600	$24,776,530	$119,622,800
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR					$3,640,000		$3,640,000
26	PROJ.MGMT-FERMCO				$7,177,400			
27	CONSTR MGMT-FERMCO				$8,373,600			$8,373,600
	FERMCO FIELD SUPPORT COSTS							$12,013,600
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$20,335,900
	ENGINEERING COSTS							$20,335,900
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$24,776,530	$1,486,600
	SUB-TOTAL (BASE ESTIMATE)							$153,458,900
32								
33	ESCALATION							
34	RISK BUDGET	17.0%						$26,088,013
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$179,546,913
35	CONTINGENCY	12.0%						$18,415,068
	TOTAL ESTIMATED COST INCLUDING CONTINGENCY							$197,961,981
37								

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS ON SITE STORAGE CEMENTATION
LOCATION- FERNALD, OHIO
PROJ.CTICENTRAL ON SITE STORAGE CELL
WBS# 1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-1A
DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MACHINE EXCAVATION W/HAND TRIM												
	EXCAVATION	1200000	CY	0.03	36000	19.49				$701,640			$701,640
	SITE DEMOLITION												
	CLEAR AND GRUB (CELL)	382400	SY	0.003	1,147	19.59				$22,470			$22,470
	CLEAR & GRUB(PMP CHANNEL AREA)	186000	SY	0.003	558	19.59				$10,931			$10,931
	ROUGH GRADING - CUT, FILL, STRIP, ETC.	382400	SY	0.005	1,912	19.59				$37,456			$37,456
	DIKES, FIREWALLS, LEVEES, ETC.	186000	SY	0.005	930	19.59				$18,219			$18,219
	SPOIL	100000	CY	0.020	2,000	18.00				$36,000			$36,000
					42,547					826,716			826,716
	GEOTECHNICAL LINERS												
	GEONET	180000	SY	0.03	5,400	16.51			0.70	$89,154		$126,000	$215,154
	RUB SHEET	63000	SY	0.05	3,150	16.51			2.16	$52,007		$136,080	$188,087
	TEXTURED GEOMEMBRANE LINER	1575000	SY	0.45	708,750	16.51			2.43	$11,701,463		$3,827,250	$15,528,713
	GEOTECHNICAL FILTER MEMBRANE	2740000	SY	0.05	137,000	16.51			1.25	$2,261,870		$3,425,000	$5,686,870
	BENTONITE LINER	1165000	SY	0.45	524,250	16.51			3.60	$8,655,368		$4,194,000	$12,849,368
						16.51							
	TOTAL (STORAGE CELL LINER)				1,378,550	16.51				22,759,861		$11,708,330	$34,468,191
	HAND EXCAVATION												
	MASTER MECHANIC	10000	HR	1	10,000	19.49				$194,900			$194,900
	SUPPORT CRAFTS	20000	HR	1.00	20,000	16.51				$330,200			$330,200
	TOTAL (HAND EXCAVATION)	30,000.0			30,000					$525,100			$525,100
	SUB TOTAL EXCAVATION & CIVIL				1,451,097					$24,111,676		$11,708,330	$35,820,006

CONTR.NO.- 24321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS ON SITE STORAGE CEMENTATION
LOCATION- FERNALD, OHIO
PROJ.CTICENTRAL ON SITE STORAGE CELL
WBS# 1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-9-1A

DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SPECIAL OR PURCHASED BACKFILL												
	GRAVEL	184000	CY	0.03	6,072	16.51			$12.30	$100,249		$2,263,200	$2,363,449
	CONTOURING FILL	88000	CY	0.15	13,200	16.51				$217,932			$217,932
	CLAY SOIL	571000	CY	0.20	114,200	16.51				$1,885,442			$1,885,442
	BACKFILL & COMPACT	685000	CY	0.15	102,750	16.51				$1,696,403			$1,696,403
	SAND	115000	CY	0.03	3,450	16.51			$5.04	$56,960		$579,600	$636,560
	TOP SOIL	50000	CY	0.25	12,500	16.51				$206,375			$206,375
	RIP RAP	200000	CY	1.00	200,000	16.51			$12.50	$3,302,000		$2,500,000	$5,802,000
	TOTAL (BACKFILL)	1709000	CY		452,172					$7,465,360		$5,342,800	$12,808,160
	WASTE HANDLING EQUIPMENT												
	36" ENCLOSED CONVEYOR	2500	LF						$600			$1,500,000	
	WASTE STORAGE OPERATION LABOR												
	1MIL TONS @400 TONS PER DAY @ 250 DAYS												
	= 5 YEARS X 16 MAN CREW @ 1813 HRS A YEAR =	145000	HR		145000	16.51				$2,393,950			$2,393,950
	TOTAL (WASTE HANDLING EQUIP.)									$2,393,950		$1,500,000	$3,893,950
	MONITORING WELLS 8 EA x 50'	400	LF					55			22000		$22,000
	DRILLING LABOR	1000	HR					48			48000		$48,000
	MOB & DEMOB	1	EA					15000			15000		$15,000
	PERSONNEL DECON	300	HR					110			33000		$33,000
	TRAINING	300	HR					45			13500		$13,500
	SUBSISTANCE	60	DAY					55			$3,300		$3,300
	TOTAL (WELL DRILLING)										$134,800		$134,800
	TOTAL CELL CONSTRUCTION				597,172					$9,859,310	$134,800	$6,842,800	$16,836,910

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- FS ON SITE STORAGE CEMENTATION
LOCATION- FERNALD, OHIO
PROJ.CTICENTRAL ON SITE STORAGE CELL
WBS# 1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1--93--9-1A
DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL FOR EXCAVATION												
	PICK UP TRUCKS	300	MO					530.00			$159,000		$159,000
	OPERATION COSTS	20000	HR					2.00			$40,000		$40,000
	633 D SCRAPER	120	MO					20175.00			$2,421,000		$2,421,000
	D-9 TRACTOR	60	MO					16455.00			$987,300		$987,300
	OPERATION COSTS	10000	HR					44.00			$440,000		$440,000
	GRADER 140"G"	60	MO					6040.00			$362,400		$362,400
	OPERATION COSTS	10000	HR					15.00			$150,000		$150,000
	COMPACTOR DANAPAC CA515	60	MO					6710.00			$402,600		$402,600
	FLAT BED TRUCK/HYDROCRANE	120	MO					1500.00			$180,000		$180,000
	MECHANICS TRUCK/WELDER/AIR COMPRESSER	60	MO					1500.00			$90,000		$90,000
	TOOL CARRIER	60	MO					1500.00			$90,000		$90,000
	CAT 980F LOADER	60	MO					10500.00			$630,000		$630,000
	OPERATION COSTS	10000	HR					30.00			$300,000		$300,000
	OPERATION COSTS TRUCKS	40000	HR					15.00			$600,000		$600,000
	DUMP TRUCKS	120	MO					2320			$278,400		$278,400
	TOTAL EQUIPMENT RENTAL										$7,130,700		$7,130,700

NOTE: ABOVE EQUIPMENT LISTED AS RENTAL EQUIPMENT ON SUMMARY SHEET

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CONTR.NO. [redacted]24321
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– FS ON SITE STORAGE CEMENTATION
LOCATION– FERNALD, OHIO
PROJ.CTICENTRAL ON SITE STORAGE CELL
WBS# 1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.– 4424321
EST. NO. C1–93–9–1A

DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SOIL/WATER/AIR FULL TCLP	2600	EA					1400			$3,640,000		$3,640,000
	TOTAL SOIL/WATER/AIR										$3,640,000		$3,640,000
	PIPING BELOW GRADE DRAINAGE PIPING 24,000' 7080 MHRS (ALLOWANCE)									$134,100		$100,300	$234,400
	TOTAL PIPING									$134,100		$100,300	$234,400

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: ON-SITE DISPOSAL CELL FOR VITRIFICATION
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-1-B
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Approximately 636,000 cubic yards (CYs) of vitrified waste would be placed within an on-site disposal cell. The disposal cell would be constructed above grade in four equal phases and have a square footprint of approximately 39 acres. Placement of vitrified waste within the cell would occur over the 10-year processing/treatment period. This cost component is applicable to Alternative 4A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- The proposed disposal cell is sited in the northeast corner of the OU3 process area. Clearing and grubbing, removal of existing underground piping and foundations, and excavation of associated contaminated soils within this area would be performed by OU3.

- Approximately 186,000 square yards (SYs) of material would be cleared and grubbed along the east, north, and west sides of the disposal cell in preparation for construction of a channel designed to protect the disposal cell from the Probable Maximum Flood.

- The disposal cell liner would incorporate (descending from top to bottom) the following:

  - 24-inch thick protective layer of uniform soil or flyash;
  - 6-inch thick sand filter;
  - 18-inch thick gravel leachate collection system;
  - primary liner of a geomembrane and geosynthetic clay;
  - 6-inch thick secondary sand filter;
  - 18-inch thick secondary leachate collection system;
  - secondary geomembrane and geosynthetic clay liner; and
  - 36-inch thick clay liner.

- Material utilized in the construction of the disposal cell foundation, liners, cap, side slope protection, and surface water diversion channels would be purchased from a local vendor and include gravel, clayey soils, sand, common fill, topsoil, and rip rap.

- Following placement of the vitrified waste, a disposal cell cover would be installed. The cover would incorporate (descending from top to bottom) the following:

  - 33-inch thick vegetative layer;
  - 6-inch thick gravel filter;
  - 36-inch thick biotic barrier of cobbles;
  - 12-inch thick sand drainage layer;
  - double layer of high density polyethylene and geosynthetic clay liner; and
  - 24-inch thick clay layer;
  - 18-inch thick contouring fill layer.

- Vitrified waste would be transported from the treatment facility to the disposal cell through an enclosed conveyor system (approximately 2,500 feet in length). The vitrified waste would be placed in the disposal cell approximately over a 10-year period. Distribution and compaction of waste within the disposal cell would be accomplished using conventional earth moving equipment.

- Interim covers would be placed on all exposed waste before the final cover is in place. A tarp would be used as an interim cover for waste exposed on a daily basis and clean fill would be used for waste exposed for a week or longer. During placement, temporary berms and diversion ditches would be used to protect the waste from overland flow.

- Eight groundwater monitoring wells, each approximately 50-feet deep, would be installed for the purpose of monitoring the performance of the disposal facility.

PIPING

- Leachate from the exposed and capped treated waste would be collected by a permanent leachate collection system. An allowance for installation of the leachate collection system has been provided.

EQUIPMENT RENTAL

- Construction of the disposal cell would be accomplished using conventional earth moving equipment.

SOIL/WATER/AIR

- In order to assess whether or not the treated waste offered for disposal is within the waste acceptance criteria of the disposal cell, samples of the treated waste would be collected and analyzed by TCLP and PCT. For costing purposes, one sample would be collected and submitted for analysis for every 500 CY of treated waste offered for disposal. The frequency of testing required to ensure product quality during the remedial effort would be established during start-up testing of the treatment system.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

6097

EST FILE #: C1-93-9-1B

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: FS/ ON SITE STORAGE CELL VITRIFICATION

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	1,157,317		$19,846,867	$134,800	$8,502,023	$28,483,700
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING (ALLOWANCE FOR UNDERGROUND PIPING)	7,080		$134,100		$100,300	$234,400
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**1,164,397**		**$19,980,967**	**$134,800**	**$8,602,323**	**$28,718,100**
11	SUPERVISION - CONTRACTOR				$3,396,800			$3,396,800
12	SM TOOLS/CONSM'BLS						$1,198,900	$1,198,900
13	EQUIPMENT RENTAL					$11,382,000		$11,382,000
14	TEMP. FACILITIES				$419,600		$779,300	$1,198,900
15	TEMP UTL'S HOOK-UP				$209,800		$389,600	$599,400
16	JOB CLEAN-UP				$419,600		$779,300	$1,198,900
17	SAFETY				$209,800		$389,600	$599,400
18	HEALTH PHYSICS				$4,927,300			$4,927,300
19	CERCLA	$1,500 PER PERSON				$873,300		$873,300
20	BOND					$287,200		$287,200
21	OVERHEAD & PROFIT					$4,894,200		$4,894,200
22	PAYRL BRD.&BENFT.				$15,373,200			$15,373,200
	INDIRECT FIELD COSTS				**$24,956,100**	**$17,436,700**	**$3,536,700**	**$45,929,500**
	DIRECT & INDIRECT FIELD COSTS				**$44,937,067**	**$17,571,500**	**$12,139,023**	**$74,647,600**
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR					$2,732,000		$2,732,000
26	PROJ.MGMT-FERMCO				$4,478,900			$4,478,900
27	CONSTR MGMT-FERMCO				$5,225,300			$5,225,300
	FERMCO FIELD SUPPORT COSTS							**$12,436,200**
28								
29								
30	ENGINEERING	**TITLE I**	**TITLE II**		**TITLE III**			$12,690,100
	ENGINEERING COSTS							**$12,690,100**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$12,139,023	$728,300
	SUB-TOTAL (BASE ESTIMATE)							**$100,502,200**
32								
33	ESCALATION							
34	RISK BUDGET	16.0%						$16,080,352
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$116,582,552**
35	CONTINGENCY	10.0%						$10,050,220
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**							**$126,632,772**
37								

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- ON SITE STORAGE CELL VITRIFICATION
LOCATION- FERNALD, OHIO
PROJ.CTICENTRAL ON SITE STORAGE CELL
WBS#1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.

DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	MACHINE EXCAVATION W/HAND TRIM (SITE)												
	EXCAVATION	782000	CY	0.05	39882	19.49				$777,300			$777,300
	MASTER MECHANIC	20000	HR	1	20,000	19.49				$389,800			$389,800
	SUPPORT CRAFTS	40000	HR	1.00	40,000	16.51				$660,400			$660,400
		842,000			99,882					1,827,500			1,827,500
	GEOTECHNICAL LINERS												
	GEONET	57000	SY	0.03	1,710	16.51			0.70	$28,232		$39,900	$68,132
	RUB SHEET	20000	SY	0.05	1,000	16.51			2.16	$16,510		$43,200	$59,710
	TEXTURED GEOMEMBRANE LINER	503700	SY	0.45	226,665	16.51			2.43	$3,742,239		$1,223,991	$4,966,230
	GEOTECHNICAL FILTER MEMBRANE	875800	SY	0.05	43,790	16.51			1.25	$722,973		$1,094,750	$1,817,723
	BENTONITE LINER	372400	SY	0.45	167,580	16.51			3.60	$2,766,746		$1,340,640	$4,107,386
	TOTAL (STORAGE CELL LINER)				440,745	16.51				7,276,700		$3,742,481	$11,019,181
	GENERAL SITE WORK												
	SITE DEMOLITION												
	CLEAR AND GRUB (CELL)	188000	SY	0.003	564	19.59				$11,049			$11,049
	CLEAR & GRUB(PMP CHANNEL AREA)	186000	SY	0.003	558	19.59				$10,931			$10,931
	ROUGH GRADING - CUT, FILL, STRIP, ETC.	188000	SY	0.005	940	19.59				$18,415			$18,415
	DIKES, FIREWALLS, LEVEES, ETC.	186000	SY	0.005	930	19.59				$18,219			$18,219
	STOCK PILE ON SITE HAUL & DUMP SPOIL	100000	CY	0.020	2,000	18.00				$36,000			$36,000
	TOTAL ROUGH GRADING				4,992					$94,613			$94,613
	SUB TOTAL EXCAVATION & CIVIL				545,619					$9,198,813		$3,742,481	$12,941,294

000127

CONTR.NO.- [redacted]4321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- ON SITE STORAGE CELL VITRIFICATION
LOCATION- FERNALD, OHIO
PROJ.CTICENTRAL ON SITE STORAGE CELL
WBS#1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.

DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SPECIAL OR PURCHASED BACKFILL												
	GRAVEL	89800	CY	0.03	2,963	16.51			$12.30	$48,919		$1,104,540	$1,153,459
	CONTOURING FILL	37760	CY	0.15	5,664	16.51				$93,513			$93,513
	CLAY SOIL	279100	CY	0.20	55,820	16.51				$921,588			$921,588
	BACKFILL & COMPACT	685000	CY	0.15	102,750	16.51				$1,696,403			$1,696,403
	SAND	56300	CY	0.03	1,689	16.51			$5.04	$27,885		$283,752	$311,637
	TOP SOIL	24300	CY	0.25	6,075	16.51				$100,298			$100,298
	RIP RAP	149700	CY	1.00	149,700	16.51			$12.50	$2,471,547		$1,871,250	$4,342,797
	TOTAL (BACKFILL)	1232160	CY		321,698					$5,360,153		$3,259,542	$8,619,695
	WASTE HANDLING EQUIPMENT												
	36" ENCLOSED CONVEYOR	2500	LF						$600			$1,500,000	
	WASTE STORAGE OPERATION LABOR												
	1MIL TONS @400 TONS PER DAY @ 250 DAYS												
	= 10 YEARS X 16 MAN CREW @ 1813 HRS A YEAR =	290000	HR		290000	16.51				$4,787,900			$4,787,900
	TOTAL (WASTE HANDLING EQUIP.)				290,000	16.51				$4,787,900		$1,500,000	$6,287,900
	DRILLING LABOR	1000	HR					48			$48,000		$48,000
	WELLS 8 EAX50'	400	LF					55			$22,000		$22,000
	MOB & DEMOB DRILLING	1	EA					15000			$15,000		$15,000
	PERSONNEL DECON	300	HR					110			$33,000		$33,000
	TRAINING	300	HR					45			$13,500		$13,500
	SUBSISTANCE	60	DAY					55			$3,300		$3,300
	TOTAL SUBCONTRACT										$134,800		$134,800
	TOTAL CELL CONSTRUCTION				611,698					$10,148,053	$134,800	$4,759,542	$15,042,395

000148

6097

CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- ON SITE STORAGE CELL VITRIFICATION
LOCATION- FERNALD, OHIO
PROJ.CTICENTRAL ON SITE STORAGE CELL
WBS#1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO.

DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	RENTAL EQUIPMENT												
1	DUMP TRUCKS	120	MO					2320			$278,400		$278,400
	PICK UP TRUCKS	600	MO					530.00			$318,000		$318,000
	OPERATION COSTS	40000	HR					2.00			$80,000		$80,000
	633 D SCRAPER	120	MO					20175.00			$2,421,000		$2,421,000
	D-9 TRACTOR	120	MO					16455.00			$1,974,600		$1,974,600
	OPERATION COSTS	20000	HR					44.00			$880,000		$880,000
	GRADER 140"G"	120	MO					6040.00			$724,800		$724,800
	OPERATION COSTS	20000	HR					15.00			$300,000		$300,000
	COMPACTOR DANAPAC CA515	120	MO					6710.00			$805,200		$805,200
2	FLAT BED TRUCK/HYDROCRANE	120	MO					1500.00			$180,000		$180,000
3	MECHANICS TRUCK/WELDER/AIR COMPRESSER	120	MO					1500.00			$180,000		$180,000
4	TOOL CARRIER	120	MO					1500.00			$180,000		$180,000
	CAT 980F LOADER	120	MO					10500.00			$1,260,000		$1,260,000
	OPERATION COSTS	20000	HR					30.00			$600,000		$600,000
	OPERATION COSTS TRUCKS(1,2,3 & 4)	80000	HR					15.00			$1,200,000		$1,200,000
	TOTAL EQUIPMENT										$11,382,000		$11,382,000

NOTE: EQUIPMENT COSTS LISTED AS REMEDIAL EQUIPMENTS ON SUMMARY SHEET

000169

CONTR.NO.- [redacted]321
CLIENT- U.S. [redacted]T. OF ENERGY
PROJECT- ON SITE STORAGE CELL VITRIFICATION
LOCATION- FERNALD, OHIO
PROJ.CT CENTRAL ON SITE STORAGE CELL
WBS#1.1.1.1.1.1.3

BUDGET ESTIMATE DETAILS

CONTR.NO. [redacted]4424321
EST. NO.

DATE: 02/18/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	ANALYTICAL LAB TESTS												
	FULL TCLP	1272	EA					1400			$1,780,800		$1,780,800
	PCT	1272	EA					750			$954,000		$954,000
	TOTAL LAB TESTS										$2,734,800		$2,734,800
	PIPING												
	BELOW GRADE DRAINAGE PIPING												
	ALLOWANCE 24000' PIPE 7080 MHRS									$134,100		$100,300	$234,400
	TOTAL PIPING									$134,100		$100,300	$234,400

FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: ON-SITE SURVEILLANCE AND MAINTENANCE
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-10-1
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Site surveillance and maintenance of the Waste Pit Area and the on-site disposal cell would continue for 30 years (for costing purposes) following completion of remediation and would consist of inspection, groundwater monitoring, and custodial maintenance and repair. This cost component is applicable to Alternatives 4A and 4B. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- The multi-layer cover over the Waste Pit Area and the on-site disposal cell will be inspected yearly by a professional engineer registered in the State of Ohio.
- General maintenance on the multi-layer cover, disposal cell, and groundwater monitoring wells will be performed throughout the year. Maintenance on the multi-layer cover and the disposal cell will include seasonal mowing operations.

EQUIPMENT RENTAL

- An allowance has been made for the equipment to implement the required maintenance activities.

SOIL/WATER/AIR

- Groundwater samples will be collected from eight groundwater monitoring wells at a frequency of two time a year. Collected samples would be submitted for metals, volatile and semivolatile organic compounds, pesticides, PCBs, dioxins, furans, radiological constituents, and general chemistry analyses.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue

Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.

- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.

- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

- Estimated costs developed within the cost estimate detail sheets and the cost estimate summary sheet are for annual costs.

EST FILE #: C1-93-10-1

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: F/S O & M SURVEILLANCE & MAINTENANCE FOR ON-SITE DISPOSAL

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	1,760		$33,152			$33,200
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**1,760**		**$33,152**			**$33,200**
11	SUPERVISION - CONTRACTOR				$5,600			$5,600
12	SM TOOLS/CONSM'BLS						$2,000	$2,000
13	EQUIPMENT RENTAL					$41,804		$41,804
14	TEMP. FACILITIES				$700		$1,300	$2,000
15	TEMP UTL'S HOOK-UP				$300		$600	$900
16	JOB CLEAN-UP				$700		$1,300	$2,000
17	SAFETY				$300		$600	$900
18	HEALTH PHYSICS				$8,200			$8,2[illegible]
19	CERCLA	$1,500 PER PERSON				$1,300		$1[illegible]
20	BOND					$300		$300
21	OVERHEAD & PROFIT					$8,800		$8,800
22	PAYRL BRD.&BENFT.				$25,500			$25,500
	INDIRECT FIELD COSTS				**$41,300**	**$52,204**	**$5,800**	**$99,304**
	DIRECT & INDIRECT FIELD COSTS				**$74,452**	**$52,204**	**$5,800**	**$132,504**
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR					$108,192		$108,192
26	PROJ.MGMT-FERMCO				$8,000			$8,000
27	CONSTR MGMT-FERMCO				$9,300			$9,300
	FERMCO FIELD SUPPORT COSTS							**$125,492**
28								
29								
30	ENGINEERING	**TITLE I**	**TITLE II**		**TITLE III**			$22,500
	ENGINEERING COSTS							**$22,500**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$5,800	$300
	SUB-TOTAL (BASE ESTIMATE)							**$280,796**
32								
33	ESCALATION							
34	RISK BUDGET							
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$280,796**
35	CONTINGENCY							
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**				**ANNUAL COST**			**$280,796**
37								

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000153

CLIENT– U.S. DEPT. OF ENERGY
PROJECT F/S O & M SURVEILLANCE AND MAINTENANCE FOR ON–SITE DISPOSAL

EST. NO. C1–93–10–1

BUDGET ESTIMATE DETAILS

DATE: 02/17/94
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COST CATAG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION AND CIVIL												
	2 LABORS, 5 DAYS A MONTH FOR MAINTENANCE UTILITIES FOR 1 YEAR 2x8HRx5DAYSx12 MO=	960	HRS	1.00	960	16.51				$15,850			$15,850
	1 ENGINEER , 3 WEEKS PER YEAR FOR INSPECTION AND REPORTING FOR 1 YEAR 1x8HRSx5DAYSx3 WEEKS=	120	HRS	1.00	120	27.41				$3,289			$3,289
	3 MEN SURVEY CREW ONE WEEK PER YEAR FOR 1 YRS 3 MENx8 HRS x 5 DAYS X 1 WEEK =	120	HRS	1.00	120	25.82				$3,098			$3,098
	OPERATORS FOR GD605A EARTH MOWERS	560	HR	1.00	560	19.49				$10,914			$10,914
	TOTAL EXCAVATION AND CIVIL				1760					$33,152			$33,152

CLIENT– U.S. DEPT. OF ENERGY
PROJECT F/S O & M SURVEILLANCE AND MAINTENANCE FOR ON–SITE DISPOSAL

EST. NO. C1–93–10–1

BUDGET ESTIMATE DETAILS

DATE: 02/17/94
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COST CATAG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL												
	EQUIPMENT RENTAL DURING SURVEILLANCE PERIOD OF 1 YEAR												
	TWO MOWERS, 5 DAYS A MONTH, 7 MONTH A YEAR, FOR ONE YEAR												
	2MOWERS x 5DAYSx7MONTHS= DIESEL POWERED KOMATSU MODEL NUMBER GD605A–2	70	DAYS						$490			$34,300	$34,300
	OPERATING COST FOR MOWER GD605A–2 70 DAYS x 8 HRS/DAY =	560	HRS						13.40			$7,504	$7,504
	TOTAL EQUIPMENT RENTAL											$41,804	$41,804

000135

CLIENT– U.S. DEPT. OF ENERGY
PROJECT F/S O & M SURVEILLANCE AND MAINTENANCE FOR ON–SITE DISPOSAL

EST. NO. C1–93–10–1

BUDGET ESTIMATE DETAILS

DATE: 02/17/94
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COST CATAG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	SOIL/WATER/AIR												
	2 ROUNDS OF SAMPLING PER YEAR FROM 8 GROUNDWATER MONITORING WELLS SO 2 x 8 WELLS x 1 YEAR = 16 SAMPLES EA.												
	GENERAL CHEMISTRY	16	EA					$1,315			$21,040		$21,040
	TOTAL METAL	16	EA					$313			$5,008		$5,008
	VOLATILE ORGANICS	16	EA					$360			$5,760		$5,760
	SEMI–VOLATILE ORGANICS	16	EA					$629			$10,064		$10,064
	PESTISIDES/PCBs/DIOXINS/FURANS	16	EA					$1,134			$18,144		$18,144
	RADIOLOGICAL CONSTITUENTS	16	EA					$3,011			$48,176		$48,176
	TOTAL SOIL/WATER/AIR										$108,192		$108,192

000156

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: OFF-SITE SURVEILLANCE AND MAINTENANCE
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-9-10-2
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

Site surveillance and maintenance of the Waste Pit Area would continue for 30 years (for costing purposes) following completion of remediation and would consist of inspection and custodial maintenance and repair. This cost component is applicable to Alternatives 5A and 5B. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- The multi-layer cover over the Waste Pit Area would be inspected yearly by a professional engineer registered in the State of Ohio.
- General maintenance on the multi-layer cover would be performed throughout the year. Maintenance on the multi-layer cover and the disposal cell would include seasonal mowing operations.

EQUIPMENT RENTAL

- An allowance has been made for the equipment to implement the required maintenance activities.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and vendor quotations.
- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.
- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.
- Estimated costs developed within the cost estimate detail sheets and the cost estimate summary sheet are for annual costs.

FERMCO ESTIMATING SERVICES

EST FILE #: C1-93-10-2 DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: F/S O & M SURVEILLANCE & MAINTENANCE FOR OFF-SITE DISPOSAL LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	648		$11,802			$11,800
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		648		$11,802			$11,800
11	SUPERVISION - CONTRACTOR				$2,000			$2,000
12	SM TOOLS/CONSM'BLS						$700	$700
13	EQUIPMENT RENTAL					$16,722		$16,722
14	TEMP. FACILITIES				$200		$500	$700
15	TEMP UTL'S HOOK-UP				$100		$200	$300
16	JOB CLEAN-UP				$200		$500	$700
17	SAFETY				$100		$200	$300
	HEALTH PHYSICS				$2,900			$2,900
	CERCLA	$1,500 PER PERSON				$500		$500
20	BOND					$100		$100
21	OVERHEAD & PROFIT					$3,300		$3,300
22	PAYRL BRD.&BENFT.				$9,000			$9,000
	INDIRECT FIELD COSTS				$14,500	$20,622	$2,100	$37,222
	DIRECT & INDIRECT FIELD COSTS				$26,302	$20,622	$2,100	$49,022
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR							
26	PROJ.MGMT-FERMCO				$2,900			$2,900
27	CONSTR MGMT-FERMCO				$3,400			$3,400
	FERMCO FIELD SUPPORT COSTS							$6,300
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$8,300
	ENGINEERING COSTS							$8,300
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$2,100	$100
	SUB-TOTAL (BASE ESTIMATE)							$63,722
32								
33	ESCALATION							
34	RISK BUDGET							
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$63,722
	CONTINGENCY							
36	TOTAL ESTIMATED COST INCLUDING CONTINGENCY				ANNUAL COST			$63,722
37								

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CONTR.NO.–
CLIENT– U.S. DEPT. OF ENERGY
PROJECT F/S O & M SURVEILLANCE AND MAINTENANCE FOR OFF–SITE DISPOSAL

EST. NO. C1–93–10–2

BUDGET ESTIMATE DETAILS

DATE: 02/17/94
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COST CATAG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION AND CIVIL												
	2 LABORS, 2 DAYS A MONTH FOR MAINTENANCE ACTIVITIES FOR 1 YEAR 2x8HRx2DAYSx12 MO=	384	HRS	1.00	384	16.51				$6,340			$6,340
	1 ENGINEER , 1 WEEK PER YEAR FOR INSPECTION AND REPORTING FOR 1 YEAR 1x8HRSx5DAYSx1 WEEK	40	HRS	1.00	40	27.41				$1,096			$1,096
	OPERATORS FOR EARTH MOWERS	224	HRS	1.00	224	19.49				$4,366			$4,366
	TOTAL EXCAVATION AND CIVIL				648					$11,802			$11,802

000159

CONTR.NO.-
CLIENT- U.S. DEPT. OF ENERGY
PROJECT F/S O & M SURVEILLANCE AND MAINTENANCE FOR OFF-SITE DISPOSAL

EST. NO. C1-93-10-2

BUDGET ESTIMATE DETAILS

DATE: 02/17/94
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COST CATAG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EQUIPMENT RENTAL												
	EQUIPMENT RENTAL DURING SURVEILLANCE PERIOD OF 1 YEAR												
	2 MOWERS, 2 DAYS A MONTH, 7 MONTH A YEAR, FOR 1 YEAR												
	TOTAL DAYS= 2MOVERSX2DAYSx7MON= DIESEL POWERED KOMATSU MODEL NUMBER GD605A-2	28	DAYS						$490			$13,720	$13,720
	OPERATING COST FOR MOWER GD605A-2 28 DAYS x 8 HRS/DAY = 224 HRS.	224	HRS						13.40			$3,002	$3,002
	TOTAL EQUIPMENT RENTAL											$16,722	$16,722

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: BORROW PIT RESTORATION (10 YEARS)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-10-3-A
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

The borrow pit area used to provide material for construction of the on-site disposal cell would require restoration. This work would consist of regrading the borrow pit area and regeneration of a vegetative cover. This cost component is applicable to Alternative 4A only. The estimate associated with this cost component is based on the following:

EXCAVATION AND CIVIL

- Regrading of approximately 400,000 square yards (SYs) of surface area.
- Spreading of approximately 90,000 cubic yards (CYs) of topsoil stockpiled during development of the borrow pit area.
- Regeneration of a vegetative cover over the disturbed area of the borrow pit.
- Standard earth moving equipment would be used during the restoration activities.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.
- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.
- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.

EST FILE #: C1-93-10-3A

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: BORROW PIT RESTORATION, 10 YEARS

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	6,300		$117,873		$72,000	$189,900
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**6,300**		**$117,873**		**$72,000**	**$189,900**
11	SUPERVISION - CONTRACTOR				$20,000			$20,000
12	SM TOOLS/CONSM'BLS						$7,100	$7,100
13	EQUIPMENT RENTAL							
14	TEMP. FACILITIES				$2,500		$4,600	$7,100
15	TEMP UTL'S HOOK-UP				$1,200		$2,300	$3,500
16	JOB CLEAN-UP				$2,500		$4,600	$7,100
17	SAFETY				$1,200		$2,300	$3,500
	HEALTH PHYSICS				$29,100			$29,100
	CERCLA	$1,500 PER PERSON				$4,700		$4,700
20	BOND					$1,900		$1,900
21	OVERHEAD & PROFIT					$24,700		$24,700
22	PAYRL BRD.&BENFT.				$90,700			$90,700
	INDIRECT FIELD COSTS				**$147,200**	**$31,300**	**$20,900**	**$199,400**
	DIRECT & INDIRECT FIELD COSTS				**$265,073**	**$31,300**	**$92,900**	**$389,300**
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$700		$1,200	$1,900
26	PROJ.MGMT-FERMCO				$23,400			$23,400
27	CONSTR MGMT-FERMCO				$27,300			$27,300
	FERMCO FIELD SUPPORT COSTS							**$52,600**
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$66,200
	ENGINEERING COSTS							**$66,200**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$94,100	$5,600
	SUB-TOTAL (BASE ESTIMATE)							**$513,700**
32								
33	ESCALATION							
34	RISK BUDGET	12.0%						$61,644
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$575,344**
	CONTINGENCY	8.0%						$41,096
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**							**$616,440**
37								

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CONTR.NO.- 4321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- BORROW PIT RESTORATION
LOCATION- FERNALD, OHIO
PROJ.CTL.-

BUDGET ESTIMATE DETAILS

CONTR.NO. 4424321
EST. NO. C1-93-10-3.
BY: D. HOPP
DATE: 10/14/93

COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	GENERAL SITE WORK												
	RECONTOURING	400000	SY	0.009	3600	19.59				$70,524			$70,524
	SPREAD STORED TOP SOIL	90000	SY	0.010	900	19.59				$17,631			$17,631
	HYDRO SEEDING	3600	MSF	0.50	1800	16.51			20	$29,718		$72,000	$101,718
					6,300	18.71				$117,873		$72,000	$189,873

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FERMCO
PROJECT & CONFIGURATION CONTROL
ESTIMATING SERVICES

BASIS OF COST ESTIMATE

PROJECT DESCRIPTION: BORROW PIT RESTORATION (5 YEARS)
PROJECT LOCATION: OU1 PIT AREA
ESTIMATE NUMBER: C1-93-10-3-B
W B S NUMBER: 1.1.1.1.1.1.3

SCOPE OF WORK

The Borrow Pit area used to provide material for construction of the on-site disposal cell would require restoration. This work will consist of regrading the borrow pit area and regeneration of a vegetative cover. This cost component is applicable to Alternative 4B only. The estimate associate with this cost component is based on the following:

EXCAVATION AND CIVIL

- Regrading of approximately 400,000 square yards (SYs) of surface area.
- Spreading of approximately 90,000 cubic yards (CYs) of topsoil stockpiled during development of the borrow pit area.
- Regeneration (through hydro seeding) of a vegetative cover over the disturbed area of the borrow pit.
- Standard earth moving equipment would be used during the restoration activities.

NOTES

- Equipment and material quantities are based on the technical description of the alternative(s). Equipment rates and corresponding operational costs are based on the Blue Book for Construction Equipment. Material costs are based on catalog prices and verbal vendor quotations.
- Unit man hours are based on published estimating cost data and the estimator's experience. Labor rates are based on current contract and FERMCO labor rates.
- Indirect field costs not identified within this cost summary narrative were determined based on the methodologies provided in Section E.3.1.2.1

EST FILE #: C1-93-10-3B

FERMCO ESTIMATING SERVICES

DATE: 26-Feb-94

CLIENT: US DOE

SUMMARY SHEET

PROJECT TITLE: BORROW PIT RESTORATION, 5 YEARS

LOCATION: FERNALD

	CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
1		EXCAVATION AND CIVIL	6,300		$117,873		$72,000	$189,900
2		CONCRETE						
3		STRUCTURAL STEEL						
4		BUILDINGS						
5		MACHINERY AND EQUIPMENT						
6		PIPING						
7		ELECTRICAL						
8		INSTRUMENTS						
9								
10								
	DIRECT FIELD COSTS		**6,300**		**$117,873**		**$72,000**	**$189,900**
11	SUPERVISION - CONTRACTOR				$20,000			$20,000
12	SM TOOLS/CONSM'BLS						$7,100	$7,100
13	EQUIPMENT RENTAL							
14	TEMP. FACILITIES				$2,500		$4,600	$7,100
15	TEMP UTL'S HOOK-UP				$1,200		$2,300	$3,500
16	JOB CLEAN-UP				$2,500		$4,600	$7,100
17	SAFETY				$1,200		$2,300	$3,500
18	HEALTH PHYSICS				$29,100			$29,1[illegible]
19	CERCLA	$1,500 PER PERSON				$4,700		$4,[illegible]
20	BOND					$1,900		$1,900
21	OVERHEAD & PROFIT					$24,700		$24,700
22	PAYRL BRD.&BENFT.				$90,700			$90,700
	INDIRECT FIELD COSTS				**$147,200**	**$31,300**	**$20,900**	**$199,400**
	DIRECT & INDIRECT FIELD COSTS				**$265,073**	**$31,300**	**$92,900**	**$389,300**
23	TRANSPORTATION & BURIAL							
24	WASTE CONTAINERS							
25	SOIL/WATER/AIR				$700		$1,200	$1,900
26	PROJ.MGMT-FERMCO				$23,400			$23,400
27	CONSTR MGMT-FERMCO				$27,300			$27,300
	FERMCO FIELD SUPPORT COSTS							**$52,600**
28								
29								
30	ENGINEERING	TITLE I	TITLE II		TITLE III			$66,200
	ENGINEERING COSTS							**$66,200**
31	SALES TAX	6.0%	SUB-TOTAL MATERIAL DOLLARS				$94,100	$5,600
	SUB-TOTAL (BASE ESTIMATE)							**$513,700**
32								
33	ESCALATION							
34	RISK BUDGET	12.0%						$61,644
	TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$575,344**
35	CONTINGENCY	8.0%						$41,[illegible]
36	**TOTAL ESTIMATED COST INCLUDING CONTINGENCY**							**$616,440**
37								

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CONTR.NO.- 4424321
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- BORROW PIT RESTORATION
LOCATION- FERNALD, OHIO
PROJ.CTL.-

BUDGET ESTIMATE DETAILS

CONTR.NO.- 4424321
EST. NO. C1-93-10-3A & 3B
BY: DICK HOPP
DATE: 02/01/94
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COST CATEG.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	TOTAL
	EXCAVATION & CIVIL												
	GENERAL SITE WORK												
	RECONTOURING	400000	SY	0.009	3,600	19.59				$70,524			$70,524
	SPREAD STORED TOP SOIL	90000	CY	0.010	900	19.59				$17,631			$17,631
	HYDRO SEEDING	3600	MSF	0.500	1,800	16.51			20	$29,718		$72,000	$101,718
	TOTAL CIVIL				6,300					$117,873		$72,000	$189,873

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APPENDIX F

OPERABLE UNIT 1
ARARs ANALYSIS

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LIST OF ACRONYMS

ARARs	applicable or relevant and appropriate requirements
$CaCO_3$	calcium carbonate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DCGs	Derived Concentration Guides
EPA	United States Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FS	feasibility study
hr	hour
lb	pound
L	liter
MCi	microCuries
ml	milliters
MCLs	maximum contaminant levels
MCLGs	maximum contaminant level goals
mg	milligrams
mrem	millirem
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
Np	Neptunium
NWP	nationwide permit
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OU	Operable Unit
PCBs	polychorinated biphenyls
pCi	picoCuries
Pu	plutonium

LIST OF ACRONYMS
(Continued)

RA	Remedial Action
RCRA	Resource Conservation Recovery Act
RI	remedial investigation
Ru	ruthenium
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
Sr	strontium
TBC	To Be Considered
Tc	technetium
Th	thorium
TSCA	Toxic Substances Control Act
U	uranium
U.S.	United States
USC	U.S. Code
WWTS	Wastewater treatment system

F.1.0 INTRODUCTION

F.1.1 PURPOSE/SCOPE

This report identifies statutory and regulatory requirements impacting remedial alternatives for the Fernald Environmental Management Project (FEMP), Operable Unit 1 (OU1) Feasibility Study (FS).

Remedial action decisions must include consideration of any applicable or relevant and appropriate federal environmental or state environmental law or facility siting law. These are known as Applicable or Relevant and Appropriate Requirements (ARARs). Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and Section 300.68(i)(1) of the National Oil and Hazardous Substance Contingency Plan (NCP) requires CERCLA response actions to attain or exceed environmental and public health ARARs unless specific waivers are obtained from the regulators. CERCLA lists specific federal environmental laws that must be considered as part of an ARARs analysis. This list includes:

- The Toxic Substances Control Act (TSCA)
- The Safe Drinking Water Act
- The Clean Air Act
- The Clean Water Act
- The Marine Protection, Research and Sanctuaries Act
- The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA), as amended

Section 121(d) of CERCLA also states that remedial actions must meet the applicable or relevant and appropriate requirements of any promulgated standards, requirements, criteria, or limitations under a state environmental or facility-siting law that is more stringent than any federal standard, requirement, criterion, or limitations. Criteria, advisories, and guidance that are not law may be used to ensure protection of human health or the environment in the absence of ARARs, or when ARARs are insufficient. These criteria, advisories, and guidance fall in the "to be considered" (TBC) category.

The analysis reflected in this report is based on data included in the Operable Unit 1 Draft Remedial Investigation (RI) Report, interviews with site staff, and review of prior regulatory compliance analyses. Wherever feasible, tentative ARAR determinations have been made based on available information. Assumptions and rationales for ARAR determinations are provided. The general approach used in this analysis is described in the following section.

F.1.2 ARAR IDENTIFICATION, SCREENING, AND ANALYSIS

Applicable or relevant and appropriate requirements are defined as:

> "... Applicable requirements are those clean-up standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site..."
>
> "...Relevant and appropriate requirements are those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site..."

CERCLA Compliance With Other Laws Manual: Interim Final, EPA/540/1G-89/006, August 1988 (herein after referred to as "EPA 1988".)

In addition: "a requirement that is judged to be relevant and appropriate must be complied with to the same degree as if it were applicable." (EPA 1988)

Other non-promulgated advisories or guidance issued by federal or state governments are not legally binding and do not have the legal status of potential ARARs. These "to-be-considered" (TBC) requirements will be evaluated along with ARARs. Atomic Energy Act (AEA) requirements for DOE's low-level radioactive waste management are incorporated into DOE Order 5820.2A, developed under DOE's AEA authority. The order is generally consistent with and typically includes equivalent NRC 10 CFR 61 technical requirements that are appropriate for DOE operations and waste management. DOE Order 5820.2A requirements are "To-Be-Considered" (TBC) requirements which,

when included in a DOE CERCLA ROD, are enforceable cleanup standards under CERCLA. Limited sections of NRC's 10 CFR 61 requirements can be "Relevant and Appropriate" or TBC only in those situations when DOE Order 5820.2A does not clearly address a specific condition or particulars of the site and supplemental requirements from 10 CFR 61 are needed to ensure protection of human health and the environment.

The identification and screening of ARARs for a site is achieved by examining the body of federal, state, and local environmental laws, regulations, standards, etc., relative to three general categories:

- Chemical-specific ARARs
- Location-specific ARARs
- Action-specific ARARs

F.1.2.1 Chemical-Specific ARARs

> "...Chemical-specific ARARs are usually health or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment..." (Page 1-13, EPA 1988)

The following are common chemical-specific standards or references that are used to establish chemical-specific ARARs:

- Federal Safe Drinking Water Act Maximum Contaminant Levels. Maximum contaminant levels (MCLs) for toxic compounds have been established under the Safe Drinking Water Act. MCLs are enforceable standards for public drinking water systems that are set as close to MCL goals (MCLGs) as feasible when considering the best available technology and treatment techniques.
- Clean Air Act National Primary/Secondary Ambient Air Quality Standards and National Emission Standards for Hazardous Air Pollutants.

Federal and State Ambient Water Quality Criteria are non-enforceable guidelines that set concentrations of pollutants that may be relevant and appropriate depending on the uses of the surface water body, the media affected, purposes of the criteria and current information. It is noted that the

FEMP National Pollution Discharge Elimination System (NPDES) permit specifically requires that discharges allow compliance with applicable state water quality standards.

F.1.2.2 Location-Specific ARARs

The location of a site is fundamental in determining its impact upon human health and the environment. Location-specific ARARS are restrictions placed on the concentration of hazardous substances or the conduct of activities because they occur in specific locations. Some special locations include floodplains, wetlands, sole source aquifers, historic places, and sensitive ecosystems and habitats (Page 1-25, EPA 1988).

The following are examples of location-specific standards or references that will be used to establish location-specific ARARs for this remedial investigation:

- National Historic Preservation Act
- Archaeological and Historic Preservation Act
- Historic Sites, Buildings and Antiquities Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- Coastal Zone Management Act
- Wild and Scenic Rivers Act
- Clean Water Act
- Rivers and Harbor Act of 1899
- RCRA Location Requirements

F.1.2.3 Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements for activities taken with respect to remedial actions. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Action-specific ARARs do not determine the remedial alternative but indicate how a selected alternative must be achieved. Action-specific ARARs may establish performance levels, actions, or technologies, as well as specific levels for discharged or residual contaminants (Page 1-29, EPA 1988).

The following are common action-specific standards or references that will be used to establish action-specific ARARs:

- Resource Conservation and Recovery Act/Land Disposal Restrictions/Minimum Technology Requirements/Land Treatment Requirements
- Marine Protection, Research and Sanctuaries Act
- Clean Air Act, National Emission Standards for Hazardous Air Pollutants
- Hazardous Waste Permit Program
- National Pollutant Discharge Elimination System (NPDES) Program
- Clean Water Act

Each requirement must be compared to the specific actions proposed for remediation of the site.

F.1.2.4 Other Potential Requirements

F.1.2.4.1 Superfund Off-Site Policy

The following provides a discussion of the Superfund Off-site Policy as issued in Federal Register, Volume 58, No. 182, dated September 22, 1993. This policy supersedes the May 1985 (revised November 1987) Off-site Policy.

The Off-Site Rule provides, that a facility used for off-site management of wastes generated from CERCLA response actions must be in physical compliance with RCRA, or other applicable Federal and State laws. In addition, the following criteria must be met:

- Units receiving CERCLA waste at RCRA Subtitle C facilities must not be releasing any hazardous wastes, hazardous constituents, or hazardous substances
- Receiving units at Subtitle C land disposal facilities must meet minimum technology requirements
- All releases from non-receiving units at land disposal facilities must be addressed by a corrective action program prior to using any unit at the facility and
- Environmentally significant releases from non-receiving units at Subtitle C treatment and storage facilities, and from all units at other-than-Subtitle C facilities, must also be

addressed by a corrective action program prior to using any unit at the facility for the management of CERCLA wastes.

Under the revised rule, EPA will make the final determination as to whether off-site facilities are acceptable under this rule to receive CERCLA wastes, with the State being an active participant during the decision-making process. In addition, the distinction between criteria for CERCLA wastes resulting from pre- and post-SARA decision documents has been removed.

F.1.2.4.2 Non-ARAR (Other) Requirements

Non-ARAR requirements are federal and state requirements that are applicable to activities related to a CERCLA cleanup that would be equally applicable whether or not the site work involved CERCLA remedial activities. Generally, these are requirements of a non-environmental nature or they apply to off-site activities. Examples include worker safety regulations, transportation requirements etc. Non-ARARs are of significance in this context only if the particular requirement is specifically applicable to the remedial activity being undertaken. If a non-ARAR requirement applies, it must be fully complied with; both substantive and administrative requirements must be met. Those non-ARAR requirements of particular interest to remedial action decision makers are those that affect or are closely related to particular remedial alternatives worker protection requirements, waste acceptance criteria, and transportation requirements are examples of requirements that must be complied with, but are not ARARs.

F.1.2.5 Waivers

Finally, it is noted that according to CERCLA Section 121(d)(4), a remedial action may be selected that does not meet ARARs if any of the following are true:

(A) The remedial action selected is only part of a total remedial action that will attain such level or standard of control when completed;

(B) Compliance with such requirements at the facility will result in greater risk to human health and the environment than alternative options;

(C) Compliance with such requirements is technically impracticable from an engineering perspective;

(D) The remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standards, requirements, criteria, or limitations through use of another method or approach;

(E) With respect to State standards, requirements, criteria, or limitations, the State has not consistently applied (or demonstrated the intention to consistently apply) the standards, requirements, criteria, or limitations in similar circumstances at other remedial actions within the State;

(F) In case of a remedial action to be undertaken solely under Section 104 (42 USC 9604) using the Fund, selection of a remedial action that attains such level or standard of control will not provide a balance between the need for protection of public health and welfare and the environment at the facility under consideration, and the availability of amounts from the Fund to respond to other sites which present a threat to public health or welfare or the environment, taking into consideration the relative immediacy of such threats.

Waiver analysis is not within the scope of this report. If a waiver is required for any particular remedial alternative, it will be discussed within the Operable Unit 1 Feasibility Study Report.

F.1.3 ORGANIZATION OF REPORT

Section F.2.0 provides a comprehensive chemical-specific ARAR analysis based on a preliminary list of chemicals of potential concern identified in the draft RI report for Operable Unit 1. Section F.3.0 details the analysis of location-specific ARARs. Section F.4.0 discusses action-specific ARARs, including an examination of the elements of the proposed remedial alternatives for Operable Unit 1 and a description of the ARARs for each element. The remedial alternatives under consideration are identified as follows:

- Alternative 1 - No Action
- Alternative 2 - In situ Containment
- Alternative 3 - In situ Treatment and Containment
- Alternative 4A - Removal, Treatment (Vitrification), and On-Property Disposal
- Alternative 4B - Removal, Treatment (Cementation/Solidification), and On-Property Disposal
- Alternative 4C - Removal, Treatment, (Drying), and On-property Disposal

- Alternative 5A - Removal, Treatment, (Thermal Drying), and Off-site Disposal at the Nevada Test Site
- Alternative 5B - Removal, Treatment, (Thermal Drying), and Off-site Disposal at a Representative Permitted Commercial Disposal Facility.

Alternatives 1, 2, and 3 are not evaluated in this ARAR analysis. Alternative 1 presumes that all ARARs are attained. Alternative 1 does not include any remedial activities; ARARs only apply where action is proposed. Alternatives 2, 3, and 4C were screened out of further evaluation in Section 3.0 of the Feasibility Study for lack of effectiveness and engineering implementability.

Section F.5.0 contains lists of other, non-ARAR requirements that may apply to remedial actions at Operable Unit 1. Section F.6.0 summarizes references used in preparing this report. Attachment I provides summary tables for chemical-specific ARARs.

F.2.0 CHEMICAL-SPECIFIC ARARS

This section identifies the chemicals or contaminants of concern in Operable Unit 1 and those standards that apply to each chemical. The standards in this section are either specifically "applicable" to a CERCLA cleanup activity or to all activities where a release of the chemical occurs to a given medium (soil, air, water, waste) or "relevant and appropriate" standards that regulate the chemical under other or similar circumstances. When a standard is noted as TBC Guidance, it means it is not promulgated as a regulation. In some cases, this TBC Guidance is in a proposed state. In some instances, the guidance is referenced in promulgated regulations as instructions and handbooks on analytical methods. When there are no ARARs for a given contaminant, or when the ARAR is not protective of human health or the environment, advisories and standards found in TBC Guidance subsections should be used. When two or more standards apply to one chemical or contaminant, the more stringent is identified as the likely ARAR.

F.2.1 CHEMICALS OF POTENTIAL CONCERN

The potential ARARs/TBCs for Operable Unit 1 are presented by medium in this appendix.

- Section F.2.2.1 - ARARs and TBC Guidance for Drinking Water and Groundwater
- Section F.2.2.2 - ARARs and TBC Guidance for Surface Water and Sediment
- Section F.2.2.3 - ARARs and TBC Guidance for Air
- Section F.2.2.4 - ARARs and TBC Guidance for Waste and Soil
- Section F.2.2.5 - ARARs and TBC Guidance for Radiation

Preliminary investigations at Operable Unit 1 have resulted in the list of contaminants of concern that appears in Table F.2-1.

F.2.2 FEDERAL AND STATE ARARs

F.2.2.1 ARARs and TBC Guidance for Drinking Water and Groundwater

F.2.2.1.1 Applicable ARARs

There are no applicable requirements for drinking water or ground water at Operable Unit 1 because there are no drinking water systems present at Operable Unit 1 or distributed from Operable Unit 1.

However, there are several requirements that are "relevant and appropriate" to actions that may be undertaken at Operable Unit 1. These requirements are discussed in Section F.2.2.1.2 and listed in Table F.2-2.

F.2.2.1.2 Relevant and Appropriate ARARs

The Maximum Contaminant Levels (MCL) for inorganic contaminants in community water systems presented in Table F.2-2 are relevant and appropriate because Operable Unit 1 may contain these contaminants, and the contaminants have the potential to migrate into the underlying aquifer and/or off-site community water systems and potential drinking water supplies. The process of choosing the most stringent ARAR for a particular contaminant in a particular medium requires a comparison of Federal and State requirements and limits for each contaminant of concern at Operable Unit 1. Attachment A contains the tables that present both the Federal and State requirements for each chemical. Table F.2.2 presents only the most stringent requirement, which is determined to be an ARAR for the cleanup. A comparison of Federal and State standards for inorganic contaminants in drinking water is presented in Table I-1 in Attachment I. The MCLs for organic contaminants in community water systems presented in Table F.2-2 are also relevant and appropriate because Operable Unit 1 may contain these organic contaminants and the potential exists for the contaminants to migrate into the underlying aquifer and/or off-site community water systems and potential drinking water supplies. The comparison of Federal and State requirements or limits on organic contaminants in drinking water is presented in Table I-2 in Attachment I. The same rationale applies to Federal and State MCLs for radioactive contaminants of concern in Table I-3. The contaminants included on the table are only those identified as contaminants of potential concern at Operable Unit 1. The comparison of Federal and State requirements to determine which is more stringent with regard to radioactive contaminants is presented in Table I-3 in Attachment I. A list of the contaminants of concern at Operable Unit 1 can be found in Table F.2-1.

Groundwater protection standards for regulated disposal facilities with the potential to contribute hazardous substances to groundwater (the uppermost aquifer) are presented in the Ohio regulations at OAC 3745-54-92 and in the Federal regulations at 40 CFR 264.94. The general substantive requirements of the applicable permit regulations for disposal facilities contain concentration limits for

contaminants in groundwater that are the same as those for drinking water. Although they are not different than those for drinking water, the Federal and State Groundwater Protection Standards and contaminant concentration limits are listed in Table I-4.

The MCLs for groundwater are relevant and appropriate to Operable Unit 1 because contaminants of concern may leach into the Great Miami Aquifer beneath the site and contaminate groundwater. For example, there is evidence that uranium-bearing runoff seeps from the Waste Storage Area to Paddys Run and infiltrates into the groundwater system through sand and gravel lenses, which may be hydrologically connected to the Great Miami Aquifer.

Table F.2-2 also contains relevant Maximum Contaminant Level Goals (MCLGs). The MCLGs for inorganic chemicals set in 40 CFR 141.51 are not applicable to remedial actions at Operable Unit 1 because they are not enforceable standards and because there are no drinking water systems on the site. Section 121(d)(2)(A) of CERCLA requires on-site remedial actions to attain MCLGs under the Safe Drinking Water Act (SDWA) where they are relevant and appropriate. Under the National Contingency Plan (NCP), EPA requires that MCLGs set at levels above zero be attained during a CERCLA cleanup where they are relevant and appropriate.

The MCLGs listed in Table F.2-2 are ARARs for remedial actions at Operable Unit 1 because they are above zero, and are relevant and appropriate because there is a potential that waste contained in the Operable Unit 1 pits may contaminate potential drinking water sources.

F.2.2.2 ARARs and TBC Guidance for Surface Water and Sediment

F.2.2.2.1 Applicable ARARs

The State of Ohio has set Water Quality Standards that establish minimum water quality requirements for all surface waters in the State, thereby protecting public health and welfare. The standards are also established to enhance, improve and maintain water quality as provided under the laws of the State of Ohio, ORC 6111.041, and the Federal Clean Water Act, 33 U.S.C. Section 1251 *et seq.* The Ohio Water Quality Standards are found in OAC 3745-1.

The Water Quality Standards consist of use designations for water bodies in the State and criteria that apply to each designation. The criteria and requirements are applicable to actions at Operable Unit 1 because remedial actions at the site could theoretically cause the discharge of treated or untreated pollutants to a surface water of the State of Ohio. An alternative must comply with the requirements in OAC 3745-1 except when the criteria are exceeded due to natural conditions alone, or when stream flow is less than the seven-day, ten-year, low-flow value or other critical low-flow values dependent on low-flow augmentation or point source augmentation. As noted earlier, the site's NPDES permit requires that all NPDES-related discharges not cause violation of any state water quality standard.

At Operable Unit 1, two surface water bodies are potentially impacted by remedial actions. These water bodies are Paddys Run and the Great Miami River which have the following use designations:

Paddys Run:

- Warm Water Aquatic Life Habitat
- Agricultural Water Supply
- Industrial Water Supply
- Primary Contact Recreational Use

The Great Miami River:

- Warm water Aquatic Life Habitat
- Agricultural Water Supply
- Industrial Water Supply
- Primary Contact Recreational Use

The "*Warm Water*" designation refers to waters capable of supporting and maintaining a balanced, integrated, adaptive community of warm water aquatic organisms having a species composition and diversity and functional organization comparable to the twenty-fifth percentile at the identified reference sites within each of the following ecoregions: the interior plateau ecoregion, the Erie/Ontario lake plains ecoregion, the western Allegheny plateau ecoregion, and the eastern corn belt plains ecoregion.

The "*Agricultural*" designation refers to waters that are suitable for irrigation and livestock watering without treatment.

The "*Industrial*" designation refers to waters that are suitable for commercial and industrial uses, with or without treatment.

The "*Primary Contact*" designation is a description of recreational use waters. These are waters that, during the recreational season are suitable for full-body contact recreation such as, but not limited to, swimming, canoeing, and scuba diving with minimal threat to public health as a result of water quality.

The definitions of all water designation terms are presented in OAC 3745-1-07.

The general water quality criteria of OAC 3745-01-04 apply to all surface waters of the State including mixing zones. They are also specifically listed as permit conditions in the sites NPDES permit. To every extent practical and possible as determined by the director, these waters shall be:

(A) Free from suspended solids or other substances that enter the waters as a result of human activity and that will settle to form putrescent of otherwise objectionable sludge deposits, or that will adversely affect aquatic life

(B) Free from floating debris, oil, scum and other floating materials entering the waters as a result of human activity in amounts sufficient to be unsightly or cause degradation

(C) Free from materials entering the waters as a result of human activity producing color, odor or other conditions in such a degree as to create a nuisance

(D) Free from substances entering the waters as a result of human activity in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing zone

(E) Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds or algae

An exception will apply for a reasonable part of time whenever dredging or construction activities occur on or near State waters during the period of time when the after effects of dredging or

construction activities degrade water quality and such activities have been authorized by the United States Army Corps of Engineers and/or 401 Water Quality Certification by the OEPA [OAC 3745-1-01(F)(2)].

Attachment I, Tables I-5 through I-12 presents the numerical and narrative criteria for warm water aquatic habitats both inside and outside the mixing zone. These requirements are applicable to remedial actions at Operable Unit 1 because:

- There are no counterpart standards in the federal requirements
- The water quality standards apply to all water bodies in the State of Ohio
- Remedial actions at the site could theoretically cause the discharge of treated or untreated pollutants to a surface water body of the State of Ohio.

Water quality standards set by EPA may be in use when there is no Ohio criteria for a particular pollutant; otherwise, the EPA's water quality criteria are unenforceable guidelines that set concentrations of pollutants that may be relevant and appropriate depending on the uses of the surface water body. Water quality criteria are established to ensure the attainment and maintenance of water quality in a specific portion of navigable waters which shall assure protection of public health, public water supplies, agricultural and industrial uses, and the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water.

F.2.2.2.2 <u>To Be Considered (TBC) Guidance</u>

Although categorized as TBC Guidance under CERCLA because of their unpromulgated status, DOE Orders must be complied with at DOE facilities. DOE Order 5400.5 sets derived concentration guides (DCG) for liquid wastes resulting from DOE activities. The DCG values for internal exposure are based on a committed dose equivalent of 100 mrem for the radionuclide taken into the body during one year. Compliance can be demonstrated using models as prescribed by EPA. DCGs are not release limits. DOE uses the guide to screen waste streams for application of best available technologies for bringing annual averages of a contaminant below the DCG at the point of discharge.

F.2.2.3 ARARs and TBC Guidance for Air

F.2.2.3.1 Applicable Air ARARs

The applicable requirements for air describe emission limits for each chemical. The applicable requirements include those regulations that regulate a chemical on the Operable Unit 1 list of contaminants of potential concern or a physical chemical form (particulate) emitted into the air without regard for location or the type of action causing the emission. Grading and clearing are actions that commonly contribute pollutants to the air, and are likely to take place as part of the Operable Unit 1 remedial response. Those air regulations applicable to remedial actions at Operable Unit 1 are presented in Table F.2-3.

F.2.2.3.2 Relevant and Appropriate ARARs

Although the relevant and appropriate air emission requirements for remedial response actions at Operable Unit 1 apply specifically to emissions of chemicals of concern at Operable Unit 1, they do not address actions exactly like those that may be proposed for Operable Unit 1. This Table F.2-3 contains a listing of the applicable or relevant and appropriate standards and guidance for air contaminants of potential concern at Operable Unit 1.

F.2.2.4 Potential ARARs and TBC Guidance for Waste and Soil

F.2.2.4.1 Applicable Hazardous Waste ARARs

Waste characteristics dictate the applicability or relevance and appropriateness of regulations for wastes at the FEMP. If waste disposed at the FEMP contains RCRA-listed constituents or is an untreated RCRA-characteristic hazardous waste and is radioactive, RCRA Subtitle C regulations are applicable and the low-level or residual regulations are relevant and appropriate, depending on the nature of the radioactive component of the waste. On the other hand, if no hazardous wastes are disposed of at the FEMP, RCRA regulations are, at most, relevant and appropriate. At this time, no RCRA-listed waste has been disposed of at Operable Unit 1 and no RCRA-characteristic waste is expected to be disposed of. That is, treatment is expected to render these wastes to be non-characteristic. Thus, RCRA hazardous waste disposal regulations are not an ARAR for remedial actions at Operable Unit 1. However, several parts of RCRA regulation apply to the generation and emissions of hazardous gases during thermal treatment or processing or to releases of hazardous chemicals to

water. These regulations have been included as relevant and appropriate for operation of the dryers and the vitrification unit. (Refer to Tables I-13 through I-18).

F.2.2.4.2 Relevant and Appropriate ARARs for Soil

There is only one citation that is directly related to contamination by hazardous substances in soil. That regulation is promulgated in 40 CFR 761.125, Subpart G, PCB Spill Cleanup Policy. Technically, this citation is to be considered. Table I-18 in Attachment I contains the requirements found in 40 CFR 761.125, Subpart G. Since the PCB concentrations in the Operable Unit 1 wastes are below 50 ppm, this regulation will probably not be triggered. There is no known or suspected disposal of regulated material after the effective date of TSCA. The possibility exists that PCB concentrations in excess of 10 ppm or 25 ppm could be present on a very localized basis. The Spill Cleanup Policy has relevance in the establishment of soil action levels.

F.2.2.4.3 Relevant and Appropriate ARARs for Waste

Remedial response actions often result in residual quantities of contaminants in soil, waste, or debris. DOE Order 5400.5 refers to limits for residual radionuclides in soil without specifying their source. Because radionuclides are present in Operable Unit 1 pit waste and are included on the list of contaminants of concern, the limits set in DOE Order 5400.5 should be considered (TBC) in an evaluation of Operable Unit 1 conditions and actions. Table F.2-5 contains relevant and appropriate requirements and the TBC guidance for radionuclides with regard to waste, soil, and debris.

F.2.2.5 Potential ARARs and TBC Guidance for Radiation

EPA regulations to control radioactive emissions to radiation doses from all sources and to all media are relevant and appropriate for DOE facilities. These requirements are listed in Table F.2-4.

F.2.2.5.1 Applicable ARARs

Only 40 CFR 61, EPA Regulations on National Emission Standards for Hazardous Air Pollutants are applicable to radiation releases at DOE facilities. NRC promulgates regulations to control radioactive emissions and radiation doses from all sources and to all media. However, these NRC regulations are

not applicable to radiation from the Operable Unit 1 remedial action because it takes place on a DOE facility, and DOE facilities are not regulated by the NRC.

F.2.2.5.2 To Be Considered Guidance

DOE Order 5400.5, Radiation Protection of the Public and the Environment, and DOE Order 5480.11, Radiation Protection for Occupational Workers, set standards and policies at DOE facilities that are contractually binding for the operating contractors and are policy orders for field office personnel. At DOE facilities, the guidance and policy contained in DOE Orders should be considered. The TBC guidance for controlling or limiting radioactive emissions and exposures are contained in Table F.2.4.

F.2.2.6 Compliance with Chemical-Specific ARARs

Table F.2-6 summarizes how each of the four alternatives retained for detailed analysis complies with the chemical-specific ARARs discussed in this section.

TABLE F.2-1

OPERABLE UNIT 1
CONSTITUENTS OF CONCERN

OPERABLE UNIT 1[a]	PCBs
Radionuclides	Aroclor 1248
Cesium-137	Aroclor 1254
Neptunium-237	
Plutonium-238	PAHs
Plutonium-239/240	Benzo(a)anthracene
Radium-228 + 1 dtr	Benzo(a)pyrene
Strontium-90 + 1 dtr	Benzo(b)fluoranthene
Technetium-99	Benzo(k)fluoranthene
Thorium-230	Chrysene
Thorium-232 + 10 dtr	Indeno(1,2,3-cd)pyrene
Uranium-234	
Uranium-235 + dtr	VOCs
Uranium-238 + 2 dtr	Tetrachloroethene
	Vinyl Chloride
Inorganic Chemicals	
Antimony	Polychlorinated
Beryllium	Dibenzodioxins
Cadmium	2,3,7,8-Tetra CDD
Chromium	Hepta CDD
Manganese	Hexa CDD
Molybdenum	Octa CDD
Mercury	
Nickel	Polychlorinated
Silver	Dibenzofurans
Thallium	Hepta CDF
Uranium	Hexa CDF
Vanadium	

SOURCE: Table D.2-9 of this FS report.

000191

TABLE F.2-2

CHEMICAL-SPECIFIC ARARS FOR WATER

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Inorganic Chemicals in Drinking Water	40 CFR 141.62 National Primary Drinking Water Standards, Maximum Contaminant Levels for Inorganic Chemicals OAC 3745-81-11 Ohio Drinking Water Regulations, Maximum Contaminant Levels for Inorganic Chemicals Pursuant to 40 CFR 141.62, MCLs for Inorganic Contaminants in community, non-transient non-community, and transient non-community drinking water systems, the following MCLs are relevant and appropriate to groundwater at Operable Unit 1: Chemical / MCL (mg/L) / Ohio (mg/L) Antimony .006 Arsenic 0.05 Barium 2.00 1.00 Beryllium .004 Cadmium 0.005 Chromium 0.1 0.05 Cyanide .2 Mercury .002 Nickel .1 Selenium 0.01 Silver 0.05	Relevant and Appropriate	Neither the Federal or State requirement is applicable because water at OU1 is not distributed to a public water system (as defined in 40 CFR 141). The Federal requirement is relevant and appropriate to protecting potential drinking water sources from the contaminants found in the operable unit. There is evidence that inorganic contaminants are present. Results of inorganic chemical analyses show that pit residues contain elevated concentrations of aluminum, calcium, iron, and magnesium. Other inorganics present in the samples included: arsenic, barium, cadmium, and lead. A possibility exists that contaminants may leach or migrate into the underlying Great Miami Aquifer which has been designated a sole source aquifer in Ohio (53 FR 15876 and 53 FR 25670). Any contaminants infiltrating into the Great Miami Aquifer near the waste storage area would flow easterly toward the Great Miami River and Southwestern Ohio Water Company. Contaminants entering the aquifer near the outfall ditch would flow south toward the village of Fernald. State regulation OAC 3745-81-11 is only an ARAR for OU1 for barium, and chromium because in these cases State MCLs are more stringent than the Federal MCLs.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
	Pursuant to 40 CFR 141.80, Control of Copper and Lead, the action level is exceeded for copper at 1.3 mg/L and the action level for lead is exceeded at 0.015 mg/L. Thus, although the standards are not MCLs, the action levels for copper and lead have been added as a relevant and appropriate regulatory requirement for drinking water. Chemical — Action Level (mg/L) Copper — 1.3 mg/L Lead — 0.015 mg/L	Relevant and Appropriate		All
Inorganic Chemicals in Drinking Water from a Solid Waste Disposal Facility (Groundwater)	40 CFR 257.3-4 EPA Regulations on Criteria for Classification of Solid Waste Disposal Facilities and Practices, Groundwater MCLs A facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary (outermost perimeter of the waste). The concentrations shall not exceed background levels or MCLs, whichever is higher. Chemical — CAS No. — MCL (mg/L) Arsenic 7440-38-2 — 0.05 Barium — 7440-39-3 — 1.0 Cadmium — 7440-43-9 — 0.01 Chromium — 7440-47-3 — 0.05 Lead — 7439-92-1 — 0.05 Selenium — 7782-49-2 — 0.01	Relevant and Appropriate	40 CFR 257.3-4 is relevant and appropriate because the operable unit contains, or potentially contains, several of the chemicals listed in the regulation. The regulation defines contamination as contributions of chemicals listed in the regulation in concentrations greater than those listed or contributions of chemicals that cause an increase in the concentration of that substance in the groundwater where the existing concentrations of the substance exceeds MCL. Wastes at OU1 may migrate into the underlying aquifer and potentially contaminate drinking water systems. Remedial actions may. The underlying aquifer is the Great Miami Aquifer and it has been designated a sole-source aquifer in Ohio (53 FR 15876 and 53 FR 25670). Note: The MCLs for arsenic, barium, cadmium, lead, and selenium are the same as those listed in the Drinking Water Regulations at 40 CFR 141.11. Thus, compliance with 40 CFR 141.62 will insure compliance with the MCLs for inorganics listed in 40 CFR 257.3-4.	4A, 4B

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TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Organic Chemicals in Drinking Water	40 CFR 141.61 EPA National Primary Drinking Water Regulations, Maximum Contaminant Levels for Organic Contaminants Vinyl chloride 75-01-4 0.002 OAC 3745-81-12 Ohio Drinking Water Regulations Maximum Contaminant Levels for Organic Chemicals The following MCLs for organic chemicals are the maximum levels of a contaminant in water which is delivered to the entry point to a distribution system after treatment: Chemical — MCL (mg/L) Benzo(a)pyrene — 0.0002 Pentachlorophenol — 0.001 Tetrachloroethene — 0.005 Vinyl chloride — 0.002 PCBs — 0.0005	Relevant and Appropriate	The requirement is not applicable because water from OU1 is not distributed through a public water system (as defined in 40 CFR 141). Sampling for these contaminants takes place per the regulation at entry points to the distribution system after treatment. The standard is an ARAR to remedial actions at OU1 because remedial actions may cause contaminants to migrate or leach into the underlying aquifer. The underlying aquifer is the Great Miami Aquifer which has been designated a sole-source aquifer in Ohio (53 FR 15876 and 53 FR 25670). Results of an organic chemical analysis of waste material in the pits show elevated concentrations of PCBs. The PCBs most frequently detected were Aroclor-1221, Aroclor-1254, Aroclor-1248, and Aroclor-1260. Waste from the Former Production Area were also stored in the waste pits.	All
	Proposed MCLs from 'Drinking Water Regulations and Health Advisories' by the Office of Water, U.S. EPA, Washingtion, D.C., May 1993. Chemical — MCL (mg/L) Benzo(a)anthracene — 0.0001 Benzo(b)fluoranthene — 0.0002 Chrysene — 0.0002 Indeno(1,2,3-c,d)pyrene — 0.0004	TBC	The proposed regulations are not ARARs for Operable Unit 1 because they are not promulgated at this time. However, the proposed limits can be used to establish cleanup levels for the site in the absence of promulgated federal and state regulations. The listed chemicals have been found to be present at Operable Unit 1 during the Remedial Investigation.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Radionuclides in Drinking Water	40 CFR 141.15 National Primary Drinking Water Standards, Maximum Contaminant Levels for Radium-226, Radium-228, and Gross Alpha Particle Radioactivity in Community Water Systems OAC 3745-81-15 Ohio Drinking Water Regulations, Maximum Contaminant Levels for Radium-226, Radium-228, and Gross Alpha Particle Radioactivity in Community Water Systems Maximum contaminant levels for radioactivity in community water systems are set as follows: • 5 Pci/L of combined radium-226 and radium-228 • 15 Pci/L of gross alpha particle activity (including radium-226, but excluding radon and uranium)	Relevant and Appropriate	This requirement is not applicable to activities at OU1 because there are no community drinking water systems involved in this remediation. The requirement is an ARAR to remedial action because several radionuclides were found in elevated concentrations on-site. Radionuclides in this operable unit could be released such that the radioactive materials in the waste could contribute to radioactivity in potential water supplies. This requirement becomes less relevant to OU1 because it excludes radon and uranium. Most of the studies performed at the site have identified uranium as the principal contaminant in surface water and sediment. Ra-226 is not widespread, nor is it found in as elevated concentrations as U-238. However, other radionuclides such as U-234, Th-230, and Tc-99 were found in elevated concentrations in several areas.	All
Radionuclides in Drinking Water	40 CFR 141.16 National Primary Drinking Water Standards, Maximum Contaminant Levels for Beta Particulate and Photoradioactivity from Man-made Radionuclides in Community Water Systems OAC 3745-81-16 Ohio Drinking Water Regulation, Maximum Contaminant Levels The average annual concentration of beta particle and photon (i.e., gamma) radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 mrem/yr.	Relevant and Appropriate	This requirement is not applicable to activities at OU1 because there are no community drinking water systems involved in remediation. The requirement is an ARAR to remedial action because several radionuclides were found in elevated concentrations on-site. Radionuclides in this operable unit could be released such that the radioactive materials in the waste could contribute to radioactivity in community water systems.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Chemicals in Drinking Water	40 CFR 141.50 Federal Maximum Contaminant Level Goals (MCLG) for Organic Chemicals Chemical — MCLG (mg/L) Polychlorinated Biphenyls (PCB) — 0.0005 Tetrachloroethylene — 0.005 Vinyl Chloride — 0.002	Relevant and Appropriate	The MCLGs for organic chemicals set in 40 CFR 141.50 are not applicable to remedial actions at OU1 because they are not enforceable standards and because there are no drinking water systems on the site directly impacted by remedial actions. There are, however, surface waters, and groundwater that could potentially be used for drinking water. The Great Miami Aquifer lies below the site and tributaries of the Great Miami River may have received contaminants from OU1 or could receive contaminants as a result of remedial action. Section 121(d)(2)(A) of CERCLA requires on-site remedial actions to attain MCLGs under the SDWA where they are relevant and appropriate. Under the NCP, EPA requires that MCLGs set at levels above zero be attained during a CERCLA cleanup where they are relevant and appropriate. For the chemicals listed (Contaminants of Concern at OU1), and because there is a potential that remedial actions at OU1 may contaminate potential drinking water sources, the MCLGs at 40 CFR 141.50 are ARARs. Note: The MCL listed in 40 CFR 141.61 for these chemicals have been removed from the ARARs table when the MCLG was more stringent than or equal to the MCL. If the MCLG is relevant and appropriate, the MCL no longer is. However, for most of the chemicals, the MCL and MCLG are the same.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Chemicals in Drinking Water	40 CFR 141.51 Federal Maximum Contaminant Level Goals for Inorganic Chemicals Chemical — MCLG (mg/L) Arsenic — 0.05 Barium — 2 Cadmium — 0.005 Chromium — 0.1 Copper and Compounds — 1.3 Thallium — 0.0005	Relevant and Appropriate	The MCLGs for inorganic chemicals in 40 CFR 141.51 are not applicable to remedial actions at OU1 because they are not enforceable standards or levels of control. Also, there are no drinking water systems on the site to be directly impacted by remedial actions. The MCLGs at 40 CFR 141.51 are relevant and appropriate to remedial actions at OU1 because remedial actions could potentially contribute contaminants to surface and/or groundwater that may be used for drinking water. Specifically, the Great Miami Aquifer is beneath the site and has been identified as a sole-source aquifer. In addition, OU1 may contribute contaminants to tributaries of the Great Miami River. Section 121(d)(2)(A) of CERCLA requires on-site remedial actions to obtain MCLGs under the SDWA where they are relevant and appropriate. Under the NCP, EPA requires that MCLGs set at levels above zero be obtained during a CERCLA cleanup where they are relevant and appropriate. Note: The MCL listed in 40 CFR 141.62 is in almost every case the same as the MCLG. If the MCL is less stringent than or equal to the goal, the goal becomes the standard and the MCL is no longer an ARAR.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Radionuclides in Drinking Water	OAC 3745-81-16 Ohio Drinking Water Regulations, Maximum Contaminant Levels for Beta Particle and Photon Radioactivity from Man-made Radionuclides in Community Water Systems Except for Tritium and Strontium, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2-liter per day drinking water intake using the 168-hr data listed in "Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure", NBS Handbook 69 as amended August 1963, U.S. Department of Commerce. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year. The average concentration of Tritium assumed to produce a total body or organ dose of 4 mrem/year is 20,000 pCi per liter. The average concentration of Strontium-90 assumed to produce a total body or organ dose of 4 mrem/year is 8 pCi/liter.	Relevant and Appropriate	This requirement is not applicable to activities at OU1 because there are no community drinking water systems involved in remediation. The requirement is an ARAR because Strontium-90 has been identified as a potential contaminant of concern due to its presence in OU1.	All
Radionuclides in Drinking Water	DOE Order 5400.5, Chapter II, Section 1.d Radiation Protection of the Public and Environment Provide a level of protection for persons consuming water from a public drinking water supply operated by the DOE so that persons consuming water from the supply shall not receive an effective dose equivalent greater than 4 mrem in a year. For multiple radionuclides, the sum of the effective dose equivalents from the radionuclides (excluding radium-226, radium-228, and radon) shall not exceed 4 mrem in a year from drinking water.	TBC	The DOE Order 5400.5 is not promulgated; thus, it is not an ARAR. It is, however, to-be-considered guidance. Note: The guidance duplicates and supplements the State of Ohio regulations OAC 3745-81-16 and the Federal regulations at 40 CFR 141.16.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Chemicals Discharged to Surface Water	OAC 3745-1 Ohio Water Quality Standards It is the purpose of these Water Quality Standards to establish minimum water quality requirements for all surface waters of the State, thereby protecting public health and welfare; and to enhance, improve, and maintain water quality as provided under the laws of the State of Ohio, and ORC 6111.041, the Federal Clean Water Act, 33 U.S.C. Section 1251 *et seq.* Whenever two or more use designations apply to the same surface water, the more stringent criteria of each use designation will apply.	Applicable	These general water quality criteria are applicable to all surface waters in the State of Ohio and no actions are excluded. SWQL are promulgated under the laws of the state of Ohio pursuant to Section 6111.041 of the ORC. State Water Quality Standards consist of designated uses for water and criteria for pollutants set at levels that are protective of those uses. State Water Quality Standards are regulatory requirements, and permit limits are established to ensure that the State use designations and criteria are met. Water Quality criteria do not apply where criteria are exceeded due to natural conditions alone. This exception does not in any way preclude abatement of human-induced nonpoint source pollution. These water quality standards do not apply to streams when the flow is less than the seven-day, ten-year, low-flow value or other critical low-flow values dependent on low-flow augmentation or point source augmentation.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Chemicals Discharged to Surface Water	OAC 3745-01-04 Criteria Applicable to All Waters The following general water quality criteria shall apply to all surface waters of the State including mixing zones. To every extent practical and possible as determined by the director, these waters shall be: (A) Free from suspended solids or other substances that enter the waters as a result of human activity and that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life; (B) Free from floating debris, oil, scum and other floating materials entering the waters as a result of human activity in amounts sufficient to be unsightly or cause degradation; (C) Free from materials entering the waters as a result of human activity producing color, odor or other conditions in such a degree as to create a nuisance; (D) Free from substances entering the waters as a result of human activity in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing zone; (E) Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae.	Applicable	These general water quality criteria are applicable to all surface waters in the State of Ohio and no actions are excluded. The criteria are promulgated under Revised Code Chapter 119. State Water Quality Standards consist of designated uses for water and criteria for pollutants set at levels that are protective of those uses. State Water Quality Standards are regulatory requirements, and permit limits are established to ensure that the State use designations and criteria are met. These general water quality criteria are applicable for discharges and actions impacting Paddys Run and the Clearwell because the discharges are to the Great Miami River. Water Quality criteria do not apply where criteria are exceeded due to natural conditions alone. This exception does not in any way preclude abatement of human-induced nonpoint source pollution. These water quality standards do not apply to streams when the flow is less than the seven-day, ten-year, low-flow value of other critical low-flow values dependent on low-flow augmentation or point source augmentation.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Chemicals Discharged to Surface Water	OAC 3745-1-07, Table 7-1 Numerical and Narrative Criteria for Aquatic Life Habitat and Water Supply Use Designation Surface Waters in the State of Ohio must comply with the maximum concentrations of each contaminant of concern listed in Table I-5 and I-6 in Attachment I for inside and outside the mixing zones of the receiving water to protect warm water aquatic habitats.	Applicable	The water quality criteria for specific pollutants are ARARs to remedial actions at OU1 because the pollutants have been identified as chemicals of concern at the site and routes of entry or discharge of pollutants to State surface waters have been identified. For example, the Clearwell currently discharges water to the FEMP WWTS which discharges to the Great Miami River. The Great Miami River and Paddys Run have been designated warm water aquatic habitats. Thus the warm water habitat criteria are ARARs when discharges of pollutants to these streams are involved.	All
Chemicals Discharged to Surface Water	OAC 3745-1-07, Table 7-10, Outside Mixing Zone Maximum Criteria for Water Hardness Dependent Parameters in Warm Water Habitats Table I-7 in Attachment I contains the numerical limits on cadmium, copper, chromium, lead, and silver.	Applicable	The water quality criteria for specific pollutants are applicable to remedial actions at OU1 because the pollutants have been identified as chemicals of concern at the site and routes of entry or discharge of pollutants to State surface waters have been identified. For example, the Clearwell currently discharges water to the FEMP WWTS which discharges to the Great Miami River. The Great Miami River and Paddys Run have been designated warm water aquatic habitats. Thus the warm water habitat criteria are applicable when discharges of pollutants to these streams are involved.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Chemicals Discharged to Surface Waters	OAC 3745-1-07, Table 7-11 Outside Mixing Zone 30-Day Average Criteria for Water Hardness Dependent Parameters in Warm Water Habitats Table I-8 in Attachment I contains the average numerical limits for cadmium, copper, chromium, lead, and silver.	Applicable	The water quality criteria for specific pollutants are applicable to remedial actions at OU1 because the pollutants have been identified as chemicals of concern at the site and routes of entry or discharge of pollutants to State surface waters have been identified. For example, the Clearwell currently discharges water to the FEMP WWTS which discharges to the Great Miami River. The Great Miami River and Paddys Run have been designated warm water aquatic habitats. Thus the warm water habitat criteria apply when discharges of pollutants to these streams are involved.	All
Chemicals Discharged to Surface Waters	OAC Table 7-12 Inside Mixing Zone Maximum Criteria for Water Hardness Dependent Criteria in Warm Water Habitats Table I-8 in Attachment I contains numerical limits for cadmium, copper, chromium, lead, and silver.	Applicable	The water quality criteria for specific pollutants are ARARs to remedial actions at OU1 because the pollutants have been identified as chemicals of concern at the site and routes of entry or discharge of pollutants to State surface waters have been identified. For example, the Clearwell currently discharges water to the FEMP WWTS which discharges to the Great Miami River. The Great Miami River and Paddys Run have been designated warm water aquatic habitats. Thus the warm water habitat criteria apply when discharges of pollutants to these streams are involved.	All
Chemicals Discharged to Surface Waters	OAC 3745-1-07 Outside Mixing Zone Maximum Criteria for pH dependent Parameters in warm water Aquatic Habitats Table I-10 in Attachment I contains the numerical limits for pentachlorophenol. OAC 3745-1-07 Inside the Mixing Zone Maximum Criteria for pH dependent Parameters in warm water Aquatic Habitats Table I-11 in Attachment I contains the numerical limits for pentachlorophenol.	Applicable	The water quality criteria for specific pollutants are applicable to remedial actions at OU1 because the pollutants have been identified as chemicals of concern at the site and routes of entry or discharge of pollutants to State surface waters have been identified. For example, the Clearwell currently discharges water to the FEMP WWTS which discharges to the Great Miami River. The Great Miami River and Paddys Run have been designated warm water aquatic habitats. Thus the warm water habitat criteria apply when discharges of pollutants to these streams are involved.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Chemicals Discharged to Surface Water	OAC 3745-1-07 Lower Miami River Temperature Criteria in Fahrenheit and degrees (Celsius) Table I-12 in Attachment I contains the acceptable monthly temperatures for water discharged to the Lower Great Miami River.	Applicable	The water quality criteria for temperature in warm water aquatic habitats may be applicable if remedial actions at OU1 result in discharges of water at temperatures that would impact the maximum or average monthly temperatures in Paddys Run or the Great Miami River.	All

000203

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Radionuclides in Surface or Groundwater	DOE Order 5400.5 Radiation Protection of the Public and the Environment The derived concentration guides contained in this order are based on the intake of water contaminated with the radionuclide of concern in concentrations that would result in a committed dose equivalent of 100 mrem for the radionuclide taken in during one year. Derived concentration guides are not release limits. The guides are used by DOE to screen waste streams for application of best available technologies for bringing annual averages of a contaminant below the derived concentration guide.	TBC	DOE Orders are not ARARs because they are not promulgated. Because they document policy, responsibilities, procedures, and/or standards specifically at DOE facilities, they should be considered when setting cleanup standards for radionuclides, particularly if they give guidance where none is available in promulgated form. The Derived Concentration Guides are relevant to OU1 because radioactive material is involved in the cleanup of OU1 and because there is evidence of contamination (uranium) in the surface water and sediments in the immediate vicinity of the waste pits. Although the derived concentration guides presented in DOE Order 5400.5 apply to liquid process waste streams, it is appropriate that these guides be considered during cleanup at OU1 because of the possibility of releasing liquid radioactive material to surface waters during remedial action.	All

TABLE F.2-2
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Radionuclides in Natural Waterways (Aquatic Species)	DOE Order 5400.5 Radiation Protection of the Public and the Environment To prevent buildup of radionuclide concentrations in sediment, liquid process waste streams containing radioactive material in settle-able solids may be released to natural waterways if the concentration of radioactive material in the solids present in the waste stream do not exceed 5 pCi/g above background levels of settle-able solids of alpha-emitting radionuclides or 50 pCi/g above background level of settle-able solids for beta-gamma-emitting radionuclides. To protect native animal aquatic organisms, the absorbed dose to these organisms shall not exceed 1 rad per day from exposure to the radioactive material in liquid wastes discharged to material waterways.	TBC	DOE Orders are not ARARs because they are not promulgated. However, they document and direct policy, responsibilities, and procedures and/or standards specifically at DOE facilities and should be considered when setting cleanup standards for radionuclides at a DOE facility. DOE Orders should be considered if the standards give guidance where none exists in promulgated form. The concentration limits on radioactive solids in liquid waste streams and on radioactive materials in liquid waste streams discharged to material waterways is relevant to cleanup actions at OU1 because of the presence of uranium in concentrations above background levels in surface water and sediment samples taken from Pits 5 and 6, the Clearwell, Paddys Run, and the drainage paths in the immediate vicinity of the waste pits. There is a possibility that remedial action at OU1 will contribute to radioactivity in the surface water and sediments of natural waterways in the vicinity of the Fernald site. Thus, although DOE Order 5400.4 refers to contributions of radioactive materials from process waste streams discharged to streams, runoff from OU1 that contributes radionuclides to natural streams is similar enough to the circumstances of active waste discharge that cleanup activities at OU1 should take into consideration the limits set forth in the Order.	All

TABLE F.2-3

CHEMICAL-SPECIFIC ARARS FOR AIR

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Lead in Air	OAC 3745-17-08 Ohio Ambient Air Quality Standards Lead and its compounds should not exceed 1.5 micrograms per cubic meter, arithmetic mean averaged over a calendar quarter.	Applicable	The State regulation at OAC 3745-17-08 is not an ARAR because it duplicates the standard for lead set by the Federal standard. In order to be an ARAR, the State standard must be more stringent.	All
Particulates in Air	OAC 3745-17-07 Ohio Ambient Air Quality Visible particulate emissions shall not exceed 20% opacity.	Applicable	The Ohio standard for particulates in air is not an ARAR because it is not more stringent than the Federal standard at 40 CFR 50.6.	All
Fugitive Dust	OAC 3745-17-08 Ohio Ambient Air Quality Use water or a dust suppression chemical when demolishing buildings, grading roads, clearing land. Applicable to the City of Cincinnati and Hamilton County.	Relevant and Appropriate	The Ohio standard for fugitive dust is applicable to remedial actions at OU1 because there is a good possibility one or more of the remedial alternatives involve grading or earth moving activities that will contribute particulates to the air. The standard is an ARAR because it applies to the city of Cincinnati and Hamilton County. Part of the plant falls in Hamilton County. The other part of the plant falls in Butler County.	All
Particulates in Air	OAC 3745-17-07 Ohio Ambient Air Quality Standards Discharges for a maximum of 6 hours may not exceed 60 % opacity.	Applicable	The State standard for particulate emissions is an ARAR because it places a time limit on particulate emissions that may work in tandem with the Federal annual average. There is the potential that a chosen alternative at the site would contribute particulates to the air.	All
Radionuclides in Air	40 CFR 61.92 EPA Regulations on National Emission Standards for Hazardous Air Pollutants Limit airborne radionuclide emissions from the entire site to 10 mrem per person (general public). NESHAPS for emissions other than radon from DOE facilities. Monitoring requirements for individual sources with an EDE of more than 0.1 mrem/yr are found at 40 CFR 61.93(b).	Applicable	40 CFR 61.92 is applicable to remedial actions taken at OU1 because radionuclides have been identified as chemicals of concern at OU1 and may be released to the air as a result of actions taken at the site.	All

TABLE F.2-3
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Radionuclides	DOE Order 5400.5 Radiation Protection of the Public and Environment DOE Order 5400.5 sets desired concentration guides (DCG) for radioactive emissions to air resulting from DOE activities. The DCG values for internal exposure are based on a committed dose equivalent of 100 mrem for the radionuclides taken into the body during one year. The DCGs comply with 40 CFR Part 61, Subpart H criterion of 10 mrem/year effective dose equivalent. Compliance is demonstrated using AIRDOS/RADDISK models as described by EPA. The DCGs are not release limits. They are one step in the process of controlling releases. DOE uses the guides to screen waste streams for application of best available technologies. If the concentration of a contaminant is above the DCG, the best available technology is applied to bring the annual averages of the contaminant below the DCG at the point of discharge. See Attachment I, Table I-21.	TBC	The guidance presented in DOE Order 5400.5 is not applicable or relevant and appropriate to remedial actions at OU1 because it is not promulgated. However, it should be considered because DOE orders set policy and procedures at DOE facilities and in this particular case provides guidance on how to control releases in such a way that the regulatory limits are met. Radionuclides are contaminants of concern at OU1.	All
Radionuclides	DOE Order 5400.5 The DCGs are given for different lung retention classes (noted as D,W, or Y, where D equals a removal half-time of 0.5 days, W equals a removal half-time of 50 days, and Y equals a removal half-time of 500 days). The derived concentration guides can be found in Table I-21 in Attachment I.	TBC	The guidance presented in DOE Order 5400.5 is not an applicable or relevant and appropriate requirement because it is not promulgated. However, it should be considered because DOE orders set policy and procedures at DOE facilities and in this particular case provides guidance on how to control releases in such a way that the regulatory limits are met. Radionuclides are contaminants of concern at OU1.	All

000207

TABLE F.2-4

CHEMICAL-SPECIFIC ARARS FOR RADIATION

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Radiation in All Media	40 CFR 192.41 Provisions The total amount of radioactive materials entering the environment from the entire uranium fuel cycle, per gigawatt-year of electrical energy produced by the fuel cycle, contains less than 50,000 curies of krypton-85, 5 millicuries of iodine-129, and 0.5 millicuries of combined plutonium-239 and other alpha-emitting transuranic radionuclides with half-lives greater than one year.	Relevant and Appropriate	40 CFR 192.41 implements standards for Uranium Mill Tailings. Because OU1 contains large quantities of uranium including radionuclides U-238, U-234, and Ra-226, the standards promulgated for uranium mill tailings are relevant to remedial actions proposed at OU1.	All
Radiation in All Media	DOE Order 5480.11 The effective dose equivalent received by any member of the public entering a controlled area is limited to 100 mrem per year. Limiting values for the assessed dose from exposure of worker to radiation are as follows. These values represent maximum limits; It is DOE policy to maintain radiation exposures as far below these limits as is reasonably achievable. Radiation Effect — Annual Dose* Equivalent (rem) Stochastic effects — 5 Nonstochastic effects lens of the eye — 15 Organ, extremity, or tissue including skin of the whole body — 50 Unborn child, full gestation period — 0.5 *annual effective dose equivalent	TBC	DOE Order 5480.11 is to-be-considered (TBC) guidance because it is not promulgated. However, DOE Orders set policy and procedures on DOE facilities and may be based on promulgated regulations. Thus at DOE facilities, DOE Orders should be given consideration.	All

TABLE F.2-4
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Uranium	40 CFR 192.12 Standards for Uranium Mill Tailings Remedial Actions shall be conducted so as to provide reasonable assurance that as a result of residual radioactive materials from any designated processing site: a) The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than 1) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and 2) 15 Pci/g, averaged over 15 cm thick layers of soil more than 15 cm below the surface.	Relevant and Appropriate	40 CFR 192.12 is relevant and appropriate for remedial actions at OU1 because much of the waste contained in the waste pits at OU1 contain material similar to the uranium mill tailings and thorium mill tailings regulated by the standard. Pit 1 contains 114,000 lbs of uranium Pit 2 contains 2,653,000 lbs of uranium and 880 lbs of thorium Pit 3 contains 284,000 lbs of uranium and 880 lbs of thorium Pit 4 contains 6.6 million lbs of uranium and 136,000 lbs of thorium Pit 5 contains 111,000 lbs of uranium and 37,000 lbs of thorium The purpose of 40 CFR 192 includes providing for long-term stabilization and isolation of residual radioactive material and control of exposure to radioactive material. This purpose is compatible with the purpose of remedial action at OU1.	All
Gamma Radiation	40 CFR 192.12 Standards for Uranium Mill Tailings Remedial Actions shall be conducted so that the level of gamma radiation shall not exceed the background level by more than 20 microroentgens/hour.	Relevant and Appropriate	40 CFR 192.12 is relevant and appropriate to remedial actions at OU1 because much of the waste contained in the waste pits at OU1 is similar to the uranium mill tailings and thorium mill tailings regulated by the standard. The purpose of 40 CFR 192 includes providing for long-term stabilization and isolation of residual radioactive material and control of exposure to radioactive material. This purpose is compatible with the purpose of remedial action at OU1.	All

TABL[illegible].2-5

CHEMICAL-SPECIFIC ARARS FOR WASTE

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
PCBs in Soil	<u>40 CFR 761.125 Requirements for PCB Spill Cleanup</u> PCBs at concentrations greater than 50 ppm are subject to decontamination TSCA requirements in 40 CFR 761.120(b). PCB containers containing non-liquid PCBs, such as contaminated soil, rags, and debris designated for disposal may be stored temporarily (up to 30 days from the date of removal) in an area that does not comply with the storage building requirements at 40 CFR 761.65 (b). <u>40 CFR 761.125(c)</u> Soils in non-restricted access areas contaminated by a PCB spill will be decontaminated to 10ppm PCB by weight, provided that the soil is excavated to a minimum depth of 10 inches. The excavated soils will be replaced with clean soils, i.e., containing 21ppm PCB, and the spill site will be restored (e.g., replacement of turf) [40 CFR 761.125(c)(4)(v)]. For soils in restricted access areas, decontaminate to 25ppm PCB by weight [40 CFR 761.125(c)(3)(v)].	TBC	Concentrations of PCBs at OU1 are expected to be less than 50 ppm. This regulation would then be considered guidance to be considered.	All

TABLE F.2-5
(Continued)

Media	Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Ra-226 + 5 daughters Ra-228 + daughter Th-230 Th-232	40 CFR 192.32 40 CFR 192.41 Limit releases of radon from uranium and thorium by-product materials to the atmosphere so as not to exceed an average release rate of 20 picoCuries per square meter per second.	Relevant and Appropriate	40 CFR 192.32 and 40 CFR 192.41 are relevant and appropriate to remedial actions at OU1 because uranium and thorium are contaminants of concern at OU1 and may be released to the atmosphere.	All
Cs-137 + daughter Np-237 + daughter Pu-238 Pu-239/240 Ru-106 Sr-90 + daughter Tc-99 Th-228 + 7 daughters U-234 U-235 + daughter U-238 + daughters	DOE Order 5400.5 Residual plus natural dose limit for public exposure to residual radioactive material are 100 mrem effective dose equivalent per year. Guidelines for residual concentrations of radionuclides in soil shall be derived from the basic dose limits by means of an environment pathway analysis using specific property data where available. Procedures for these derivations are given in DOE/CH-8901. Residual concentrations of radioactive material in soil are defined as those in excess of background concentrations averaged over an area of 100 square meters. Control and Stabilization and Administrative Control features shall be designed to provide to the extent reasonably achievable, an effective life of 50 years with a minimum life of at least 25 years. Groundwater shall be protected in accordance with legally applicable Federal and State standards.	TBC	DOE Order 5400.5 presents DOE limits on residual radionuclides in soil without specifying their source. The order should be considered during the remediation of OU1 because the radionuclides listed are contaminants of concern at OU1 and may be released to the environment during remediation or after closure.	All
Ra-226 + 5 daughters Ra-228 + daughter Th-230 Th-232	DOE Order 5400.5 Residual plus natural dose limit for public use exposure to residual radioactive material are 100 mrem effective dose equivalent per year. Guidelines for residual concentrations are 5 pCi/g, averaged over the first 15 cm of soil below the surface; and 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface.	TBC	Remedial actions at OU1 may result in residual radioactivity in waste or soil. DOE Order 5400.5 issues limits for residual dose and concentrations for radionuclides of concern at OU1.	All

TABL .2-6

COMPLIANCE STATUS OF ALTERNATIVES WITH CHEMICAL-SPECIFIC ARARS

Requirement	Alternative 4A	Alternative 4B	Alternative 5 A&B
Applicable Chemical-Specific Federal ARARs			
40 CFR 61, EPA Regulations on National Emission Standards for Hazardous Air Pollutants Subpart H, National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities Subpart Q, National Emission Standard for Radon Emissions From Department of Energy Facilities	Engineering practices (such as spraying) will be implemented during all phases of remedial action, including excavation, treatment and construction of an on-site disposal cell to prevent pollution due to fugitive dust and particulate matter emissions. The disposal cell will also be constructed to control radon emissions from the OU1 waste material. This alternative should be able to comply with Subpart H and Subpart Q. This will be demonstrated during the Remedial Design phase.	Engineering practices (such as spraying) will be implemented during all phases of remedial action, including excavation, treatment and construction of an on-site disposal cell to prevent pollution due to fugitive dust and particulate matter emissions. The disposal cell will be constructed to control radon emissions from the OU1 waste material. This alternative should be able to comply with the requirements of Subpart H and Subpart Q. This will be demonstrated during the Remedial Design phase.	Engineering practices (such as spraying) will be implemented during all phases of remedial action, including excavation, treatment and construction of on-site support facilities to prevent pollution due to fugitive dust and particulate matter emissions. This alternative should be able to comply with the requirements of Subpart H and Q as the source of potential radionuclide and radon emissions will be excavated and removed from the site.
Relevant and Chemical-Specific Federal ARARs			
40 CFR 141.15 and .16 National Primary Drinking Water Standards, Maximum Contaminant Levels for Radionuclides (OAC 3745-81-15) and 3745-81-16	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The removal and treatment of the source of contamination of drinking water should provide compliance with 40 CFR 141.15 and .16.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The removal and treatment of the source of contamination of drinking water should provide compliance with 40 CFR 141.15. and .16.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and shipment to a licensed commercial disposal facility or the NTS. The removal of the source of contamination of drinking water should provide compliance with 40 CFR 141.15 and .16.

TABLE F.2-6
(Continued)

Requirement	Alternative 4A	Alternative 4B	Alternative 5 A&B
40 CFR 141.50 and .51 Federal Maximum Contaminant Level Goals for Organic and Inorganic Chemicals	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The removal and treatment of the source of contamination of drinking water should provide compliance with 40 CFR 141.50 and .51.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The removal and treatment of the source of contamination of drinking water should provide compliance with 40 CFR 141.50 and .51.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and shipment off site to a licensed commercial disposal facility or the NTS. The removal of the source of contamination of drinking water should provide compliance with 40 CFR 141.50 and .51.
40 CFR 141.61 and .62 The National Primary Drinking Water Standards, Maximum Contaminant Levels for Inorganic Chemicals (OAL 3745-81-11 and OAC 3745-81-12)	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The removal and treatment of the source of contamination of drinking water should provide compliance with 40 CFR 141.62.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, from treatment, and disposal in a disposal cell. This removal and treatment of the source of contamination of drinking water should provide compliance with 40 CFR 141.62.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal and shipment to a commercial disposal facility off-site or the NTS. This alternative should provide compliance with 40 CFR 141.62.
40 CFR 192.02, 192.12, 192.32, and 192.41 Federal Health and Safety Standards for Uranium and Thorium Mill Tailings	Removal of the waste from its current location, treatment, and disposal in a cell is expected to provide protection to the public health and environment for 1000 years and would ensure that concentrations of radium-226 in land would not exceed the levels spelled out in this regulation. The disposal cell will be specifically designed for the requirement. This alternative should provide compliance with the requirements of 40 CFR 192.	Removal of the waste from its current location, treatment, and disposal in a cell is expected to provide protection to the public health and environment for 1000 years and would ensure that concentrations of radium-226 in land would not exceed the levels spelled out in this regulation. The disposal cell will be specifically designed for the requirement. This alternative should provide compliance with the requirements of 40 CFR 192.	Removal of the waste from its current location, drying, and transportation of the waste to an off-site facility should provide protection of the public health and environment for 1000 years and would ensure that concentrations of radium-226 in land would not exceed the levels spelled out in this regulation. This alternative should provide compliance with the requirements of 40 CFR 192.

TABLE [illegible].2-6
(Continued)

Requirement	Alternative 4A	Alternative 4B	Alternative 5 A&B
40 CFR 257.3-4 EPA Regulations on Criteria for Classification of Solid Waste Disposal Facilities and Practices, Groundwater MCLs	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The disposal cell will be specifically designed for the requirement. The design of the on-site disposal cell will provide compliance with 40 CFR 257.3-4.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The disposal cell will be specifically designed for the requirement. The design of the on-site disposal cell will provide compliance with 40 CFR 257.3-4.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and shipment off site to a permitted and licensed commercial disposal facility or the NTS. This alternative should provide compliance with 40 CFR 257.3-4.
Applicable Chemical-Specific Ohio ARARs			
OAC 3745-21-02(C) and OAC 3745-21-03(D) Ambient Air Quality Standards and Guidelines and Methods of Ambient Air Quality Measurements (for Non-Methane Hydrocarbons)	Process off-gas will be treated through a condenser and a scrubber. These methods should adequately comply with OAC 3745-21-02(C) and OAC 3745-21-03(D).	Process off-gas will be treated through a condenser and a scrubber. These methods should adequately comply with OAC 3745-21-02(C) and OAC 3745-21-03(D).	Process off-gas will be treated through a condenser and a scrubber. These methods should adequately comply with OAC 3745-21-02(C) and OAC 3745-21-03(D).
OAC 3745-21-07(G)(2) Control of Emissions of Organic Material from Stationary Sources	The most recent RI data do not show the need for control of VOCs; However, process off-gas will be treated through a condenser and a scrubber. This alternative should comply with OAC 3745-21-07(G)(2).	The most recent RI data do not show the need for control of VOCs; However, process off-gas will be treated through a condenser and a scrubber. This alternative should comply with OAC 3745-21-07(G)(2).	The most recent RI data do not show the need for control of VOCs; However, process off-gas will be treated through a condenser and a scrubber. This alternative should comply with OAC 3745-21-07(G)(2).

TABLE F.2-6
(Continued)

Requirement	Alternative 4A	Alternative 4B	Alternative 5 A&B
Relevant and Appropriate Chemical-Specific Ohio ARARs			
OAC 3745-1 Ohio Water Quality Standards	Remediation has been designed to control surface water in the waste pits as excavation proceeds. Contaminated water will be directed to sumps in the pit floor, then pumped to the clearwell, then to the FEMP Waste Water Treatment Plant and treated such that discharge does not cause violation of the NPDES permit. This system should control discharge of contamination to waterways and provide compliance with the OAC 3745-1.	Remediation has been designed to control surface water in the waste pits as excavation proceeds. Contaminated water will be directed to sumps in the pit floor, then pumped to the clearwell, then to the FEMP Waste Water Treatment Plant and treated such that discharge does not cause violation of the NPDES permit. This system should control discharge of contamination to waterways and provide compliance with OAC 3745-1.	Remediation has been designed to control surface water in the waste pits as excavation proceeds. Contaminated water will be directed to sumps in the pit floor, then pumped to the clearwell, then to the FEMP Waste Water Treatment Plant and treated such that discharge does not cause violation of the NPDES permit. This system should control discharge of contamination to waterways and provide compliance with OAC 3745-1.
OAC 3745-81-16 Ohio Drinking Water Regulations, Maximum Contaminant Levels for Beta Particle and Photon Radioactivity from Man-Made Radionuclides in Community Water Systems	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The removal and treatment of the source of contamination of drinking water should provide compliance with OAC 3745-81-16.	All water from OU1 will be piped to the FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and disposal in a disposal cell. The removal and treatment of the source of contamination of drinking water should provide compliance with OAC 3745-81-16.	All water from OU1 will be piped to FEMP WWTS for treatment and discharge. Final remediation of the site involves waste removal, treatment, and shipment to a licensed commercial disposal facility or the NTS. The removal of the source of contamination of drinking water should provide compliance with OAC 3745-81-16.
To-Be-Considered Guidance			
DOE Order 5400.5 Radiation Protection of the Public and the Environment, Derived Concentrations for Radionuclides in Surface and Groundwater	Remediation has been designed to control surface water in the waste pits as excavation proceeds. Contaminated water will be directed to sumps in the pit floor, then pumped to the clearwell, then to the FEMP WWTS. This system should control discharge of radioactive contamination to waterways and provide compliance with DOE Order 5400.5.	Remediation has been designed to control surface water in the waste pits as excavation proceeds. Contaminated water will be directed to sumps in the pit floor, then pumped to the clearwell, then to the FEMP WWTS. This system should control discharge of radioactive contamination to waterways and provide compliance with DOE Order 5400.5.	Remediation has been designed to control surface water in the waste pits as excavation proceeds. Contaminated water will be directed to sumps in the pit floor, then pumped to the clearwell, then to the FEMP WWTS. This system should control discharge of radioactive contamination to waterways and provide compliance with DOE Order 5400.5.

TABL[illegible].2-6
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Requirement	Alternative 4A	Alternative 4B	Alternative 5 A&B
DOE Order 5820.2A Radioactive Waste Management	Individuals working on the site will be protected from exposure to radioactivity during remedial actions. Completion of the remediation will vitrify the source of radioactive contamination, removing the long-term risk of exposure from the site and providing adequate shielding in the form of a disposal cell to eliminate possible exposure of workers and the public. This alternative should provide compliance with the DOE policy and guidance in DOE Order 5820.2A.	Individuals working on the site will be protected from exposure to radioactivity during remedial actions. Completion of the remediation will solidify the source of radioactive contamination, removing the long-term risk of exposure from the site and providing adequate shielding in the form of a disposal cell to eliminate possible exposure of workers and the public. This alternative should provide compliance with the DOE policy and guidance in DOE Order 5820.2A.	Individuals working on the site will be protected from exposure to radioactivity during remedial actions. Completion of the remediation will remove the source of radioactive contamination from the site completely, removing the long-term risk of exposure from the site. This alternative should provide compliance with the DOE policy and guidance in DOE Order 5820.2A.

F.3.0 LOCATION-SPECIFIC ARARS

Remedial action associated with Operable Unit 1 will invoke compliance with various requirements under Executive Orders, EPA regulations and Ohio EPA regulations, and DOE orders that are related to actions to be taken in a particular location (i.e. location-specific). The laws generally protect resources, and contain some substantive requirements, but the majority of the requirements are administrative. Off-site CERCLA actions are required to meet administrative requirements, but on-site CERCLA actions are not. Consultation with appropriate Federal, State or local agencies is an administrative requirement that should be considered early to take advantage of the expertise of the Federal authorities. Table F.3-1 summarizes the potential location-specific ARARs for Operable Unit 1. Table F.3-2 presents how each alternative under consideration complies or does not comply with the identified ARARs.

TABLE F.3-1

LOCATION-SPECIFIC ARARS

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
16 USC 1531 and 50 CFR 200 and 204, Endangered Species Act (ORC 1518, 1513.25) (OAC 1501-18-1-01) These citations impose requirements upon Federal agencies regarding endangered or threatened species and habitat of such species that has been designated as critical. The citations require that any agencies undertaking an action, insure, in consultation with the Department of the Interior that the action is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat. Other requirements apply if it is determined that listed species or critical habitat could be affected. 40 CFR 257.3 also directs that solid waste disposal facilities not contribute to the taking of any endangered threatened species or to adverse impacts to critical habitats.	Applicable	The remedial activities taking place at the FEMP qualify as a Federal agency action. Preliminary surveys pertaining to the immediate OU1 study area have not indicated the presence of any endangered or threatened species (or habitat). Consultation with the Department of Interior will formalize the preliminary surveys. If any endangered or threatened species are encountered the additional requirements of the referenced regulation would be applicable. This citation is also applicable to any consideration related to siting a new waste disposal facility.	ALL
16 USC 66 *et seq.*, Fish and Wildlife Coordination Act Requires consultation with other state agencies for any activities which might affect any body of water for the purpose of conserving fish and wildlife resources.	Applicable	Remedial actions at OU1 may have the potential to affect wildlife and fish in Paddys Run and the Miami River.	ALL
16 USC 469, Archaeological and Historic Preservation Act Requires preservation of artifacts and data associated with archaeological finds.	Applicable	Historical data and artifacts are not expected to be discovered or destroyed during remedial activities at OU1. Nevertheless, the requirements of the law are applicable although it is expected that OU1 activities will be in compliance with the law.	ALL
16 USC 470 *et seq.*, National Historic Preservation Act Requires protection of sites listed or eligible for listing in the *National Register of Historic Places*.	Applicable	Historic sites listed or eligible for listing in the National Register of Historic Places are not present at OU1 nor is it expected that any will be. Nevertheless, the requirements of the law are applicable.	ALL
16 USC 470 (a) Archaeological Resources Protection Act Requires permit for removal of any archaeological resources from Federal lands.	Applicable	OU1 is located on Federal land. Although archeological resources are not expected on the site, the requirements of the law remain applicable to OU1 remedial activities.	ALL

TABL[illegible].3-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
16 USC 431-433 and USC 461-467, Antiquities Act and Historic Sites Act. Requires identification and preservation of cultural resources on Federal lands. Includes natural landmarks.	Applicable	Although OU1 is not expected to contain cultural resources or natural landmarks of significance, it is located on Federal land and the law is applicable should any cultural resources be discovered during remedial actions on site.	ALL
25 USC 3001, Native American Graves Protection and Repatriation Act Provides for return of human remains and cultural objects from Native American graves to affiliated tribes.	Applicable	Although OU1 does not contain known American Indian burial grounds, this law would apply should graves and human remains be discovered during excavation of the waste pits or construction of a disposal cell.	ALL
42 USC 1996, American Indian Religious Freedom Act Provides for tribal access by native peoples to grave sites and sites of cultural, symbolic, or religious significance.	Applicable	Although no sites of this nature have been identified at OU1, the law is applicable to Federal lands and activities. Provisions will be included in the Remedial Action Work Plan to comply with the law should any sites be unexpectedly encountered.	ALL
Executive Order 11593, Protection and Enhancement of Cultural Environment. Requires an inventory of site for potential historic places for eligibility in the *National Register of Historic Places*.	Applicable	The requirement is applicable to activities at OU1. An updated inventory will be completed prior to remedial action.	ALL
Executive Order 11990, Protection of Wetlands This order requires that Federal agencies take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands and to prescribe procedures to implement the policies and procedures of the Executive Order.	Applicable	The remedial activities taking place at the FEMP qualify as a Federal agency action. Wetlands identification efforts indicate the presence of wetlands within the OU1 boundary and others in the immediate vicinity of OU1. This order should also be considered when siting a new waste disposal facility. The order is codified at 10 CFR 1022.	ALL
Executive Order 11988, Floodplain Management This order requires Federal agencies undertaking actions within a floodplain to evaluate the potential the action has for adverse impact on the floodplain. If it is determined that adverse impacts could occur, the effects of the action must be minimized to the extent practical.	Applicable	The remedial activities taking place at the FEMP qualify as a Federal agency action. OU1 is in the immediate vicinity of the Paddys Run Floodplain. At a minimum the requirement to evaluate effects of the remedial action on the floodplain should be considered. This citation may also be an ARAR to any consideration related to siting a new waste disposal facility.	ALL

TABLE F.3-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
10 CFR 1022, Protection of Wetlands and Floodplain Management 10 CFR 1022 contains the DOE regulation implementing Executive Order 11990. 40 CFR 6, Appendix A describes EPA's policy for complying with Executive Order 11990	Applicable	The remedial activities taking place at the FEMP qualify as a Federal agency action. Preliminary wetlands identification efforts indicate the presence of wetlands within the OU1 boundary and others in the immediate vicinity of OU1. OU1 is also in the immediate vicinity of the Paddys Run Floodplain. Preliminary engineering efforts indicate that remedial action can be undertaken while avoiding impacts to the floodplain.	ALL
33 CFR 330, Nationwide Permit Program (33 CFR 323 and OAC 3745-32) The U. S. Corps of Engineers can issue a Nationwide Permit (NWP) as a general permit for certain classes of actions that involve dredge or fill activities in wetlands or navigable waters. Discharges into wetlands may require a wetland delineation.	Applicable	Waste will be excavated from the waste pits at OU1. The waste will be handled, dried, and transported or vitrified and disposed of on-site. These activities may require dredge and fill operations that impact jurisdictional wetlands. Nationwide permit #38 applies to the class of dredge and fill operations associated with the cleanup of hazardous and Toxic Waste. If remedial activities exceed the limitations for a NWP, an individual permit for the dredge and fill activities may be sought.	ALL
40 CFR 241.200, On-Site Solid Nonhazardous Waste Management Facilities Provides requirements for site evaluation and site selection at the following sections: 241.200-2, 241.201-2, 241.202-2. 241.203-2, 241.204-2, 241.205-2, 241.206-2, 241.207-2, 241.208-2, 241.209-2, and 241.210-2.	Applicable	40 CFR 241 requirements for site evaluation and site selection are applicable to remedial actions proposed at OU1 should any alternatives be chosen that require construction of a new on-site solid waste disposal area.	4A, 4B
40 CFR 257.3 Provides criteria to determine whether a solid waste disposal facility will pose a reasonable probability of adverse effects on floodplains and endangered species. The solid waste facility should not restrict flow of base flood or floodplain capacity, result in release of waste, or result in the taking or destruction of endangered species or habitats.	Applicable	The requirements of 40 CFR 257.3 are an ARAR to remedial actions at OU1 for alternatives requiring construction of a solid waste disposal facility. The floodplain at Paddys Run is within the boundaries of OU1 and siting of any new facilities would have to take into consideration the potential impact on floodplains and endangered species, and the impact of floodwater on the disposal facility.	4A, 4B

TABL[illegible].3-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
40 CFR 258.12, Protection of Wetlands New municipal solid waste landfill units must not be located in wetlands unless the State approves otherwise.	Relevant and Appropriate	On-site alternatives might involve the construction of an on-site solid waste landfill which might impact wetlands.	4A, 4B
40 CFR 6, Appendix A Must take action to avoid adverse impacts to wetlands. Minimize potential harm and preserve and enhance wetlands.	Applicable	Surveys have identified small amounts of wetlands within the OU1 boundaries. Larger wetland tracts are in the general vicinity of OU1. CERCLA requires that the lead agency in a CERCLA action consult with agencies expert in determining the impact on wetlands. The Corps of Engineers has jurisdictional authority over characteristic wetlands.	ALL
40 CFR 6.302 Must protect fish and wildlife from activities affecting streams or rivers. Contact Fish and Wildlife Service to assure protection.	Applicable	CERCLA requires consultation with other expert agencies when remedial activities are off-site; when actions are on-site, consultations are recommended but not required. Through consultation with the Fish and Wildlife Services, DOE will determine the substantive requirements of 40 CFR 6.302 that apply to OU1 or construction of a new solid waste disposal area should one be considered necessary in the chosen remedial alternatives. 40 CFR 6.302 is an ARAR to remedial actions at OU1 because they may potentially impact Paddys Run or other tributaries of the Great Miami River.	ALL
Clean Water Act § 404 and 33 CFR 321 Provides standards for discharge of dredged fill material to navigable waters and wetlands. CWA Section 401 states water quality certifications required for activities that constitute the discharge of dredged or fill material into wetlands or waters of the U.S.	Relevant and Appropriate	CWA 404 and 33 CFR 321 are ARARs to remedial actions at OU1 with regard to discharge of dredged fill material into navigable waters. No navigable waters are found on-site; however, material such as soil, debris and old fill material may be excavated from the waste pits at OU1 and discarded in an on-site landfill or shipped off-site. The substantive requirements of the CWA protecting surface waters of the State of Ohio can be found in Section 3.2.2 where the water quality standards promulgated by the State of Ohio (OAC 3745-1) in compliance with the Federal Clean Water Act, 33 U.S.C. Section 1251, et seq., are discussed in detail. Wetlands are found within OU1 as previously discussed.	ALL

TABLE F.3-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
OAC 3745-27-07 (A)(3) Solid waste disposal facility may not be located in a floodway.	Relevant and Appropriate	OAC 3745-27-07 (A)(3) is an ARAR to any solid waste storage or disposal facility that may be constructed on-site or off-site as part of the chosen remedial action for OU1. Floodplains exist along Paddys Run near the boundary of OU1. When considering construction, flood Insurance maps should be consulted to determine what areas are included in the 100-year and 500-year floodplain. Consultations with the Army Corps of Engineers are required by CERCLA for on-site remedial actions in the floodplain and recommended for off-site construction in a floodplain.	4A, 4B
OAC 3745-27-07 (B)(1) Sanitary landfill may not be located in sand or gravel pit where sand and gravel are not completely covered.	Relevant and Appropriate	OAC 3745-27-07 (B)(1) is an ARAR should the chosen remedial alternative include construction of a sanitary landfill on-site at OU1.	4A, 4B
OAC 3745-27-07 (B)(2) Sanitary landfill may not be located in limestone or sandstone quarry unless deemed acceptable by director.	Relevant and Appropriate	OAC 3745-27-07 (B)(2) is an ARAR for remedial actions at OU1 should the chosen remedial action include siting and construction disposal facility.	4A, 4B
OAC 3745-27-07 (B)(3) Limits of solid waste placement may not be located in: a) National park or recreation area; b) candidate area for potential inclusion in National park system; c) State park or established State park purchase area; d) any property within boundary of National park or recreation area that has not been acquired or is not administered by the Department of the Interior.	Relevant and Appropriate	OAC 3745-27-07 is an ARAR should the chosen remedial action alternative include construction of a new or solid waste disposal facility for wastes excavated from OU1.	4A, 4B
OAC 3745-27-07 (B)(4) No sanitary landfill located in surface and subsurface area surrounding a public water supply well through which contaminants might move toward and reach public supply well in five years.	Relevant and Appropriate	OAC 3745-27-07 (B)(4) is an ARAR to remedial actions at OU1 even though a public water supply well is not located on-site. Because the FEMP, including OU1, lies over the Great Miami Aquifer, which has been designated a sole-source aquifer by the EPA, it is an ARAR should one remedial action alternative include construction of a hazardous waste or solid waste disposal facility on-site for disposal of wastes excavated from OU1.	4A, 4B

TABL[illegible].3-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
OAC 3745-27-07 (B)(5) No sanitary landfill located above a designated sole source aquifer under the Safe Drinking Water Act.	Relevant and Appropriate	OAC (3745-27-07 (B)(5) is an ARAR to remedial actions at OU1 because the FEMP lies over the Great Miami Aquifer, which was designated a sole-source aquifer by the EPA. Should a remedial action alternative include construction of a hazardous sanitary landfill on-site to contain wastes excavated from OU1, then a waiver or exemption of the ARAR would be sought.	4A, 4B
OAC 3745-27-07 (B)(6) No sanitary landfill within 1,000 feet of: a) State natural preserve; b) State wildlife area; c) State scenic river; d) State nature preserve; e) areas designated, owned, and managed by the Ohio Historical Society as a nature preserve; f) National wildlife refuge or National scenic area; g) special interest or research natural area in Wayne National Forest; h) stream segments that are State resource water, cold water habitat, or exceptional warm water habitat.	Relevant and Appropriate	OAC 3745-27-07 is an ARAR should a remedial action alternative include construction of a solid waste landfill for wastes excavated from OU1. An on-site facility would comply with this ARAR.	4A, 4B
OAC 3745-27-07 (B)(7) No solid waste placement and leachate management system within 200 feet of fault with displacement in holocene time.	Relevant and Appropriate	OAC 3745-27-07 (B)(7) is an ARAR to on-site remedial action at OU1 should the chosen remedial action alternative include construction of a new solid waste storage or disposal facility.	4A, 4B
OAC 3745-27-07 (B)(8) No sanitary landfill in area of potential subsidence due to underground mine.	Relevant and Appropriate	OAC 3745-27-07 (B)(8) is an ARAR to remedial actions at OU1 should the selected remedial alternative include construction of a sanitary landfill for wastes excavated from OU1. An on-site disposal facility could probably comply with this requirement.	4A, 4B
OAC 3745-27-07 (B)(9) Unless deemed acceptable by the director, no sanitary landfill located above unconsolidated aquifer capable of sustaining a yield of 100 gpm for a 24-hour period to a water supply well located within 1,000 feet of solid waste placement.	Relevant and Appropriate	OAC 3745-27-07 (B)(9) is an ARAR to remedial actions at OU1 should the selected remedial alternative include construction of a sanitary landfill for wastes excavated from OU1. At this time, there are no water supply wells located on-site, but the FEMP is located over the Great Miami Aquifer, which was designated a sole-source aquifer by EPA.	4A, 4B

TABLE F.3-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
OAC 3745-27-07 (B)(10) No solid waste placement or leachate management system located in regulatory floodplain unless approved by the director.	Relevant and Appropriate	OAC 3745-27-07 (B)(10) is an ARAR should the chosen remedial alternative for OU1 include construction of a sanitary landfill. Floodplains exist along Paddys Run near the boundary of OU1. When considering construction, flood Insurance maps should be consulted to determine what areas are included in the 100-year and 500-year floodplain. Consultations with the Army Corps of Engineers are required by CERCLA for on-site remedial actions in the floodplain and recommended for off-site construction in a floodplain. The purpose of this restriction is to prevent the spread of landfill debris and pollutants by floodwater should a flood wash out the landfill.	4A, 4B
OAC 3745-27-07 (B)(11) No solid waste placement within 1,000 feet of a water supply well or developed spring unless certain conditions are met.	Relevant and Appropriate	The restrictions placed by OAC 3745-27-07 are an ARAR to siting, construction, and operation of a solid waste storage or disposal area.	4A, 4B
OAC 3745-27-07 (B)(12) No solid waste placement within 300 feet of property line unless approved by the director.	Relevant and Appropriate	OAC 3745-27-07 (B)(12) is an ARAR to remedial actions at OU1 should the chosen remedial action include solid waste disposal on-site.	4A, 4B
OAC 3745-27-07 (B)(13) No solid waste placement within 1,000 feet of domicile without written approval of owner unless approved by the director.	Relevant and Appropriate	OAC 3745-27-07 (B)(13) is an ARAR to on-site remedial actions at OU1 should a solid waste disposal or storage facility be part of the chosen remedial action alternative. However, no domiciles are within the 1,000-foot restriction.	4A, 4B
OAC 3745-27-07 (B)(14) No solid waste placement within 200 feet of stream, lake or natural wetland unless approved by the director.	Relevant and Appropriate	OAC 3745-27-07 (B)(14) is an ARAR to remedial actions at OU1 should the chosen remedial action include solid waste placement on-site. Several wetlands exist within the boundaries of OU1 and Paddys Run. An intermittent tributary of the Great Miami River runs along the west side of the FEMP property between the waste storage area and the site boundary.	4A, 4B

TABL[illegible].3-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
OAC 3745-27-07 (B)(15) Isolation distance between uppermost aquifer system and bottom of recompacted soil liner is not less than 15 feet of in-situ or added geologic material deemed acceptable by the director.	Relevant and Appropriate	OAC 3745-27-07 (B)(15) is an ARAR to remedial actions at OU1 should the chosen remedial action include waste disposal on-site. The Great Miami Aquifer is beneath the FEMP so the distance between the recompacted soil liner beneath the waste disposal area and the aquifer will have to be taken into consideration.	4A, 4B

TABLE F.3-2

COMPLIANCE STATUS OF ALTERNATIVES WITH LOCATION-SPECIFIC ARARS

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
Applicable Location-Specific Federal ARARs			
16 USC 66 *et seq.*, Fish and Wildlife Coordination Act	This alternative should provide compliance with 16 USC 66 *et seq.*	This alternative should provide compliance with 16 USC 66 *et seq.*	These alternatives should provide compliance with 16 USC 66 *et seq.*
16 USC 469, Archaeological and Historic Preservation Act'	This alternative should provide compliance with 16 USC 469.	This alternative should provide compliance with 16 USC 469.	These alternatives should provide compliance with 16 USC 469.
16 USC 470 *et seq.*, National Historic Preservation Act	This alternative should provide compliance with 16 USC 470 *et seq.*	This alternative should provide compliance with 16 USC 470 *et seq.*	These alternatives should provide compliance with 16 USC 470 *et seq.*
16 USC 470 (a) Archaeological Resources Protection Act	This alternative should provide compliance with 16 USC 470 (a).	This alternative should provide compliance with 16 USC 470 (a).	These alternatives should provide compliance with 16 USC 470 (a).
16 USC 431-433 and USC 461-467, Antiquities Act and Historic Sites Act.	This alternative should provide compliance with 16 USC 431-433 and USC 461-467.	This alternative should provide compliance with 16 USC 431-433 and USC 461-467.	These alternatives should provide compliance with 16 USC 431-433 and USC 461-467.
25 USC 3001, Native American Graves Protection and Repatriation Act	This alternative should provide compliance with 25 USC 3001.	This alternative should provide compliance with 25 USC 3001.	These alternatives should provide compliance with 25 USC 3001.
42 USC 1996, American Indian Religious Freedom Act	This alternative should provide compliance with 42 USC 1996.	This alternative should provide compliance with 42 USC 1996.	These alternatives should provide compliance with 42 USC 1996.
16 USC 1531 and 50 CFR 200 and 204, Endangered Species Act (ORC 1518, 1513.25) (OAC 1501-18-1-01)	Although the FEMP is located within the range of the Indiana bat, a federally listed endangered species, no sighting has occurred on the FEMP. This alternative would not impact the bat or any other endangered species.	Although the FEMP is located within the range of the Indiana bat, a federally listed endangered species, no sighting has occurred on the FEMP. This alternative would not impact the bat or any other endangered species.	Although the FEMP is located within the range of the Indiana bat, a federally listed endangered species, no sighting has occurred on the FEMP. These alternatives would not impact the bat or any other endangered species.

TABL[illegible].3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
10 CFR 1022, Protection of Wetlands and Floodplain Management	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Preliminary engineering indicates that remedial action can be implemented while not impacting the floodplain. The remedial activities relative to wetlands will be handled through the USCOE Nationwide Permit (NWP) Program where possible. When not covered by a NWP, the action will meet requirements mandated by individual permits per 33 CFR 323. This alternative should provide compliance with 10 CFR 1022.	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Preliminary engineering indicates that remedial action can be implemented while not impacting the floodplain. The remedial activities relative to wetlands will be handled through the USCOE NWP Program where possible. When not covered by a NWP, the action will meet requirements mandated by individual permits per 33 CFR 323. This alternative should provide compliance with 10 CFR 1022.	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Preliminary engineering indicates that remedial action can be implemented while not impacting the floodplain. The remedial activities relative to wetlands will be handled through the USCOE NWP Program where possible. When not covered by a NWP, the action will meet requirements mandated by individual permits per 33 CFR 323. These alternatives should provide compliance with 10 CFR 1022.
33 CFR 330, Nationwide Permit Program (33 CFR 323 and OAC 3745-32)	This alternative would comply with dredge and fill permit requirements.	This alternative would comply with dredge and fill permit requirements	These alternatives would comply with dredge and fill permit requirements.

TABLE F.3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
40 CFR 6, Appendix A describes EPA's policy for complying with Executive Order 11990	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Remedial design will minimize impacts to wetlands. Any unavailable impacts will be undertaken in accordance with 33 CFR 323 or 330. This alternative should provide compliance with 40 CFR 6 and the Clean Water Act.	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Remedial design will minimize impacts to wetlands. Any unavailable impacts will be undertaken in accordance with 33 CFR 323 or 330. This alternative should provide compliance with 40 CFR 6 and the Clean Water Act.	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Remedial design will minimize impacts to wetlands. Any unavailable impacts will be undertaken in accordance with 33 CFR 323 or 330. These alternatives should provide compliance with 40 CFR 1022 and the Clean Water Act.

TABL[illegible].3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
Relevant and Appropriate Federal Requirements			
Section 404, Clean Water Act	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Remedial activities involving the discharge of dredge or fill material in wetlands and waters of the U.S. will be conducted in accordance with the substantive requirements of 33 CFR 323 and 330 and OAC 3745-32. This alternative will provide compliance with the Clean Water Act.	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Remedial activities involving the discharge of dredge or fill material in wetlands and waters of the U.S. will be conducted in accordance with the substantive requirements of 33 CFR 323 and 330 and OAC 3745-32. This alternative will provide compliance with the Clean Water Act.	Surveys have identified small areas of emergent wetland associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall within the boundaries of OU1. Remedial activities involving the discharge of dredge or fill material in wetlands and waters of the U.S. will be conducted in accordance with the substantive requirements of 33 CFR 323 and 330 and OAC 3745-32. These alternatives will provide compliance with the Clean Water Act.
40 CFR 241.200, On-Site Solid Nonhazardous Waste Management Facilities	This alternative would comply with the solid waste management facility design standards.	This alternative would comply with the solid waste management facility design standards.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
40 CFR 258.12, Protection of Wetlands (Solid Waste Disposal Facility)	Surveys have identified small areas of emergent wetlands associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall with the boundaries of OU1. Construction of an on-site disposal facility might impact wetlands.	Surveys have identified small areas of emergent wetlands associated with the tributaries and ditches of Paddys Run. The floodplains of Paddys Run also fall with the boundaries of OU1. Construction of an on-site disposal facility might impact wetlands.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility disposal requirements are not ARARs for these alternatives.

TABLE F.3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
40 CFR 264.18, EPA Regulations for Owners and Operators of Permitted Hazardous Waste Facilities, Location Standards	This alternative would comply with the solid waste management requirements	This alternative would comply with the solid waste management requirements	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

000230

TABL[illegible].3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
Applicable State Requirements			
OAC 3745-27-07 (A)(3), Ohio Solid Waste Disposal Regulations, Floodways	The FEMP site is located above the Great Miami's present day floodplain. In addition, the on-site disposal cell will have a riprap-lined channel that will protect the disposal cell from the Probable Maximum Flood. The Paddys Run floodplain will be avoided. This alternative is expected to comply with OAC 3745-27-07(A)(3).	The FEMP site is located above the Great Miami's present day floodplain. In addition, the on-site disposal cell will have a riprap-lined channel that will protect the disposal cell from the Probable Maximum Flood. The Paddys Run floodplain will be avoided. This alternative is expected to comply with OAC 3745-27-07(A)(3).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(1), Ohio Solid Waste Disposal Regulations, sand and gravel pits	The on-site disposal cell will be constructed above-grade. This alternative is expected to comply with OAC 3745-27-07(B)(1).	The on-site disposal cell will be constructed above-grade. This alternative is expected to comply with OAC 3745-27-07(B)(1).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(2), Ohio Solid Waste Disposal Regulations, limestone or sandstone quarries	The on-site disposal cell will be constructed above-grade. This alternative is expected to comply with OAC 3745-27-07(B)(2).	The on-site disposal cell will be constructed above-grade. This alternative is expected to comply with OAC 3745-27-07(B)(2).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(3), Ohio Solid Waste Disposal Regulations, special recreation areas.	The FEMP site is not located in any of the areas listed in OAC 3745-27-07(B)(3). This alternative is expected to comply with OAC 3745-27(B)(3).	The FEMP site is not located in any of the areas listed in OAC 3745-27-07(B)(3). This alternative is expected to comply with OAC 3745-27(B)(3).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABLE F.3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
OAC 3745-27-07 (B)(4), Ohio Solid Waste Disposal Regulations, public water supply well.	There are no public wells near the FEMP site. This alternative is expected to comply with OAC 3745-27(B)(4).	There are no public wells near the FEMP site. This alternative is expected to comply with OAC 3745-27(B)(4).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(5), Ohio Solid Waste Disposal Regulations, sole-source aquifer	OU1 overlies a two- to three-mile-wide buried Pleistocene valley known as the New Haven Trough. This valley was formed by the ancestral Ohio River during the Pleistocene and was subsequently filled with glacial outwash materials that were in turn covered by glacial overburden. The outwash deposits in this buried valley under OU1, are a part of the Great Miami Aquifer, which is a widely distributed buried valley aquifer.	OU1 overlies a two- to three-mile-wide buried Pleistocene valley known as the New Haven Trough. This valley was formed by the ancestral Ohio River during the Pleistocene and was subsequently filled with glacial outwash materials that were in turn covered by glacial overburden. The outwash deposits in this buried valley under OU1, are a part of the Great Miami Aquifer, which is a widely distributed buried valley aquifer.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABL[illegible].3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
OAC 3745-27-07 (B)(5), Ohio Solid Waste Disposal Regulations, sole source aquifer (continued)	Aside from surface streams, the valley fill aquifer system is the major source of drinking water in southeastern Ohio (DOE, 1993). An exemption from the Sole-Source Aquifer rule can be granted if the Director determines under ORC 3743.02 (G) that no adverse impact to human health or safety or the environment will occur due to granting the exemption. This alternative cannot comply with the requirement spelled out in OAC 3745-27-07(B)(5). An exemption would need to be sought to implement the alternative.	Aside from surface streams, the valley fill aquifer system is the major source of drinking water in southeastern Ohio (DOE, 1993). An exemption from the Sol-Source Aquifer rule can be granted if the Director determines under ORC 3743.02 (G) that no adverse impact to human health or safety or the environment will occur due to granting the exemption. This alternative cannot comply with the requirement spelled out in OAC 3745-27-07(B)(5). An exemption would need to be sought to implement the alternative.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(6), Ohio Solid Waste Disposal Regulations, special habitats and historic sites.	The proposed disposal cell would not be located within 1000 feet of any of the resources listed in OAC 3745-27-07(B)(6). This alternative is expected to comply with OAC 3745-27-07(B)(6).	The proposed disposal cell would not be located within 1000 feet of any of the resources listed in OAC 3745-27-07(B)(6). This alternative is expected to comply with OAC 3745-27-07(B)(6).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABLE F.3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
OAC 3745-27-07 (B)(7), Ohio Solid Waste Disposal Regulations, faults	Throughout the 19th and 20th centuries, no damaging earthquakes have been recorded within 71 miles of the FEMP site. This alternative is expected to comply with OAC 3745-27-07(B)(7).	Throughout the 19th and 20th centuries, no damaging earthquakes have been recorded within 71 miles of the FEMP site. This alternative is expected to comply with OAC 3745-27-07(B)(7).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(8), Ohio Solid Waste Disposal Regulations, underground mine	No underground mines are located on the FEMP site. This alternative is expected to comply with OAC 3745-27-07(B)(8).	No underground mines are located on the FEMP site. This alternative is expected to comply with OAC 3745-27-07(B)(8).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(9), Ohio Solid Waste Disposal Regulations, unconsolidated aquifer	The on-site disposal cell would be located above an unconsolidated high yield aquifer. An exemption or waiver may be required.	The on-site disposal cell would be located above an unconsolidated high yield aquifer. An exemption or waiver may be required.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(9), Ohio Solid Waste Disposal Regulations, unconsolidated aquifer (continued)	The remedial actions would instead allow the waste that is already located above the unconsolidated aquifer to be consolidated and redisposed in a more stable manner. This alternative is expected to comply with OAC 3745-27-07(B)(9).	The remedial actions would instead allow the waste that is already located above the unconsolidated aquifer to be consolidated and redisposed in a more stable manner. This alternative is expected to comply with OAC 3745-27-07(B)(9).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABL[illegible].3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
OAC 3745-27-07 (B)(10), Ohio Solid Waste Disposal Regulations, floodplain	The FEMP site is located above the Great Miami's present day floodplain. In addition, the on-site disposal cell will have a riprap-lined channel that will protect the disposal cell from the Probable Maximum Flood. The Paddys Run floodplain will be avoided. This alternative is expected to comply with OAC 3745-27-07(B)(10).	The FEMP site is located above the Great Miami's present day floodplain. In addition, the on-site disposal cell will have a riprap-lined channel that will protect the disposal cell from the Probable Maximum Flood. The Paddys Run floodplain will be avoided. This alternative is expected to comply with OAC 3745-27-07(B)(10).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(11), Ohio Solid Waste Disposal Regulations, water supply well or developed spring	The on-site disposal cell would not be located within 1000 feet of a water supply well or developed spring. This alternative is expected to comply with OAC 3745-27-07(B)(11).	The on-site disposal cell would not be located within 1000 feet of a water supply well or developed spring. This alternative is expected to comply with OAC 3745-27-07(B)(11).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(12), Ohio Solid Waste Disposal Regulations, property line	The on-site disposal cell would not be located within 300 feet of a property line. This alternative is expected to comply with OAC 3745-27-07(B)(12).	The on-site disposal cell would not be located within 300 feet of a property line. This alternative is expected to comply with OAC 3745-27-07(B)(12).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(13), Ohio Solid Waste Disposal Regulations, domicile	The disposal cell would not be located within 1000 feet of a domicile. This alternative is expected to comply with OAC 3745-27-07(B)(13).	The disposal cell would not be located within 1000 feet of a domicile. The alternative is expected to comply with OAC 3745-27-07(B)(13).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABLE F.3-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternatives 5 A&B
OAC 3745-27-07 (B)(14), Ohio Solid Waste Disposal Regulations, stream, lake or natural wetland	The on-site disposal cell would not be located within 200 feet of a stream, lake, or natural wetland. The alternative is expected to comply with OAC 3745-27-07(B)(14).	The on-site disposal cell would not be located within 200 feet of a stream, lake, or natural wetland. The alternative is expected to comply with OAC 3745-27-07(B)(14).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-27-07 (B)(15), Ohio Solid Waste Disposal Regulations, isolation distance between the uppermost aquifer and the bottom of the facility.	It is expected that the isolation distance between the uppermost aquifer system and the bottom of the on-site disposal cell recompacted soil liner will be greater than 15 feet. This alternative is expected to comply with OAC 3745-27-07(B)(15).	It is expected that the isolation distance between the uppermost aquifer system and the bottom of the on-site disposal cell recompacted soil liner will be greater than 15 feet. This alternative is expected to comply with OAC 3745-27-07(B)(15).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
OAC 3745-54-18, Ohio Standards for the Management of Hazardous Waste, Seismic Considerations and floodplains	No damaging earthquakes have occurred within 71 miles of the FEMP site, and the FEMP site is located above the present day floodplain of the Great Miami River. This alternative is expected to comply with OAC 3745-54-18.	No damaging earthquakes have occurred within 71 miles of the FEMP site, and the FEMP site is located above the present day floodplain of the Great Miami River. This alternative is expected to comply with OAC 3745-54-18.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

F.4.0 ACTION-SPECIFIC ARARS

This section presents ARARs related to specific elements of proposed remedial alternatives. The ARARs for proposed remedial actions were analyzed by breaking the proposed alternatives into their component actions. Some actions are common to all or most of the alternatives. Others are actions specific to treatment, storage, and disposal alternatives.

Waste characteristics dictate the applicability or relevance and appropriateness of regulations for waste found at the FEMP. If waste disposed at the FEMP contains RCRA-listed constituents or is an untreated RCRA-characteristic hazardous waste and is radioactive, RCRA Subtitle C regulations are applicable. If no hazardous wastes are disposed of at the FEMP, RCRA regulations are, at most, relevant and appropriate for on-site actions. No RCRA-listed waste has been disposed of at Operable Unit 1, and no RCRA characteristic waste is expected to be disposed of. Thus, RCRA hazardous waste disposal regulations are not ARARs for remedial actions at Operable Unit 1. However, RCRA regulations apply to the generation and emission of hazardous gases during thermal treatment or processing. These requirements have been included as relevant and appropriate for operation of the rotary dryers and the vitrification unit.

F.4.1 BRIEF DESCRIPTION OF ALTERNATIVES

A number of preliminary alternatives were evaluated for the remediation at Operable Unit 1. Of these, two are analyzed in this report. Surface water and other liquids from dewatering efforts will be removed from the waste pits for treatment at a site-wide water treatment facility and will not be further addressed by this report. Similarly groundwater remediation efforts are encompassed within another operable unit and are not considered in this analysis.

F.4.1.1 Alternative No. 1 - No Action

Under the no-action alternative, no remedial activities will be undertaken at Operable Unit 1. This alternative must be evaluated under the requirements of the NCP and it serves as a baseline against which other alternatives are measured. Because no remedial activities are being considered under the

no-action alternative, no ARARs analysis is performed. The no-action alternative presumes all ARARs are obtained, if it is selected.

F.4.1.2 Alternative No. 2 - In Situ Containment

This alternative was screened out of further consideration due to lack of effectiveness and engineering implementability. The ARARs for this alternative are not evaluated in this report.

F.4.1.3 Alternative No. 3 - In Situ Treatment and Containment

This alternative was screened out of further consideration due to lack of effectiveness and engineering implementability. The ARARs for this alternative are not evaluated in this report.

F.4.1.4 Alternative No. 4 - Removal, Waste Treatment (Vitrification or Cementation), and On-Property Disposal

Alternative No. 4A includes removal, waste treatment (vitrification), and on-property disposal. Alternative No. 4B includes removal, waste treatment (cementation/solidification), and on-property disposal. ARARs for this alternative are evaluated in this report.

F.4.1.5 Alternative No. 5 - Removal, Waste Treatment, and Off-Site Disposal

Alternative 5A includes removal, treatment, and off-site disposal at the Nevada Test Site. Alternative 5B includes removal, treatment, and off-site disposal at a representative permitted commercial disposal facility. ARARs for the on-site portions of these alternatives are evaluated in this report.

F.4.2 ORGANIZATION OF THIS SECTION

The ARARs for the remediation of Operable Unit 1 are presented in table form. Table F.4-1 presents the media requirement, ARAR determination (applicable, relevant and appropriate, or to-be-considered), rationale for that determination, and the numbers of the alternatives that will need to comply with that requirement. Table F.4-2 lists each requirement without detail and describes how each alternative under consideration proposes to comply with the requirement, or if it cannot comply with the requirement.

TABLE F.4-1

ACTION-SPECIFIC ARARS

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
40 CFR Part 61, Subpart H Emissions of other radionuclides at DOE facilities are limited to a 10 mrem/yr annual dose. The rule also contains specific regulatory procedures for EPA approvals and reporting requirements.	Applicable	Any contribution by the remediation selected at OU1 to the overall dose for the entire site must not result in exceedance of the standard.	All
40 CFR Part 61, Subpart Q Emission of radon-222 from DOE facilities is limited to 20 pCi/m^2-s on an annual average.	Applicable	The FEMP has been specifically identified as a regulated entity in the regulations based on the history of releases at this facility.	All
40 CFR Part 192 Regulations apply to control of radioactive material at depository sites; includes corrective action and closure.	Relevant and Appropriate	Applies to radioactive material (by-product) under Section 108 of UMTRCA. Significant portions of OU1 waste material are sufficiently similar to UMTRCA waste.	4A, 4B
40 CFR 192.02 Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings Control of residual radioactive material shall be designated to: a) be effective for up to 1,000 years, to the extent reasonably achievable, and in any case, for at least 200 years, and b) provide reasonable assurance that releases of radon-222 to the atmosphere will not exceed an average rate of 20 picocuries/meter^2/second or increase the annual average concentration of radon-222 in air at or above the disposal sight by more than one-half picocurie per liter.	Relevant and Appropriate	Much of the waste in OU1 is sufficiently similar to the Uranium Mill Tailings of UMTRCA, and the contemplated disposal facility, in both purpose and design at OU1, is similar to the UMTRCA disposal cell.	4A, 4B

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
40 CFR 192.20 Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings Implementing agencies shall establish methods and procedures to provide "reasonable assurance" that the provisions in 40 CFR 192.02 are satisfied. This is to be done through use of analytic models and site-specific analyses.	Relevant and Appropriate	Much of the waste in OU1 is sufficiently similar to the Uranium Mill Tailings of UMTRCA, and the contemplated disposal facility, in both purpose and design at OU1, is similar to the UMTRCA disposal cell.	4A, 4B
40 CFR 192.20(a)(2) Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings Protection of water should be considered in the analysis for reasonable assurance of compliance with the provisions of § 192.02. The hydrologic and geologic assessment to be conducted at each site should include a monitoring program sufficient to establish background groundwater quality through one or more upgradient wells and identify the presence and movement of plumes associated with the tailings piles.	Relevant and Appropriate	Much of the waste in OU1 is sufficiently similar to the Uranium Mill Tailings of UMTRCA, and the contemplated disposal facility, in both purpose and design at OU1, is similar to the UMTRCA disposal cell.	4A, 4B
40 CFR 192.20(a)(1) Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings Purpose of 40 CFR 192.02 is to provide for long-term stabilization and isolation in order to inhibit misuse and spreading of residual radioactive materials, control releases of radon to air, and protect water.	Relevant and Appropriate	Much of the waste in OU1 is sufficiently similar to the Uranium Mill Tailings of UMTRCA, and the contemplated disposal facility, in both purpose and design at OU1, is similar to the UMTRCA disposal cell.	4A, 4B
40 CFR 192.32(b) Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings Requires that disposal areas comply with the closure performance standard in 40 CFR 264.111 with respect to non-radiological hazards and shall be designed to provide reasonable assurance of control of radiological hazards for 1,000 years to the extent reasonably achievable and, in any case, for at least 200 years, and limit releases of radon-222 from uranium by-product materials to the atmosphere so as to not exceed an average release rate of 20 picocuries/meter^2/second.	Relevant and Appropriate	Much of the waste in OU1 is sufficiently similar to the Uranium Mill Tailings of UMTRCA, and the contemplated disposal facility, in both purpose and design at OU1, is similar to the UMTRCA disposal cell.	4A, 4B

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
40 CFR 192.41 Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings Uranium provisions noted above also apply to thorium.	Relevant and Appropriate	Much of the waste in OU1 is sufficiently similar to the Uranium Mill Tailings of UMTRCA, and the contemplated disposal facility, in both purpose and design at OU1, is similar to the UMTRCA disposal cell.	4A, 4B
40 CFR 241, Subpart B (OAC 3745-27), RCRA Subtitle D On-Property Solid Nonhazardous Waste Management Facilities Design standards are presented in the following citations: 241.200-2, 241.201-2, 241.202-2, 241.203-2, 241.204-2, 241.205-2, 241.206-2, 241.207-2, 241.208-2, 241.209-2, and 241.210-2.	Relevant and Appropriate	Solid, nonhazardous wastes generated as a result of remediation must be managed in accordance with Federal and State regulations. This requirement would apply to the solid wastes generated by the remedial action.	All
Discharge of Storm Water Runoff 40 CFR 122.26 (OAC 3745-38) Storm water runoff from landfills, construction sites, and industrial activities must be monitored and controlled. A Storm Water Pollution Prevention Plan (SWPPP) is required for construction activities which result in a total land disturbance of 5 or more acres.	Applicable	Required of all industrial waste sites and construction sites of greater than 5 acres that discharge storm water runoff to the waters of the United States. Some remedial alternatives evaluated might disturb more than 5 acres of land.	All
Discharge of Treatment System Effluent 40 CFR 125.100 40 CFR 125.104 Best Management Practices Development and implement a BMP program to prevent the release of toxic or hazardous pollutants to waters of the U.S. Development and implementation of a sitewide BMP Program is also required as a condition of the FEMP NPDES Permit.	Relevant and Appropriate	All of the proposed actions have the potential for releases and runoff from the operable unit. The requirement is not applicable because BMP under the NPDES permit program applies only to ancillary facilities of manufacturing units that might have releases of toxic or hazardous pollutants. The purpose of the BMP program is relevant and appropriate to prevent releases from spills or runoff during the implementation of remedial actions. The FEMP has an approved Best Management Practices Plan.	All

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Hazardous Waste Determinations 40 CFR 262.11 (OAC 3745-52-11) Any generator of waste must determine whether or not the waste is hazardous.	Relevant and Appropriate	These procedures are established to determine whether wastes are subject to the requirements of RCRA. These procedures are relevant and appropriate to determine whether OU1 pit wastes exhibit the characteristics of hazardous waste, or are otherwise similar to RCRA hazardous waste.	All
Closure 40 CFR 264, Subpart G (OAC 3745-55-(11-16)) Operator must close facility in a manner that: • Minimizes the need for further maintenance • Minimizes post-closure escape of hazardous constituents • Complies with specific unit type closure requirements	Relevant and Appropriate	These requirements are relevant and appropriate because the residues are sufficiently similar to hazardous waste and some remedial alternatives might require closure as outlined in this standard. (The requirement for submittal of survey plot will not pertain to the off-site alternatives unless on-property residuals require management as a land fill).	4A, 4B
Post-Closure 40 CFR 264 Subpart G 40 CFR 264.117 (OAC 3745-55-17) 40 CFR 264.119 (OAC 3745-55-19) Post-closure care and use of property for a period as necessary to protect human health and the environment including: • Access controls • Monitoring Post-closure notices must include deed notation/use restriction.	Relevant and Appropriate	These requirements are relevant and appropriate because the residues are sufficiently similar to hazardous waste and some remedial alternatives might leave residues in place.	4A, 4B

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Corrective Action for SWMUs 40 CFR Subpart S 40 CFR 264.552,.553 Corrective Action Management Unites (CAMUs) might be designated at the site as areas where remediation wastes (solid, hazardous, or contaminated media and debris) might be placed during the process of remediation. Temporary units (TUs) consisting of tanks and container storage units might be used to store and treat hazardous waste during the process of corrective action.	Relevant and Appropriate	During the process of remediation, waste materials might require temporary management in containment buildings, temporary units, stockpiles or, other land based units for the purpose of staging, treating or disposing the material. All of the materials generated from remediation of OU1 are considered remediation wastes. Some of the waste material might exhibit a RCRA characteristic, or otherwise be sufficiently similar to hazardous waste to make this requirement relevant and appropriate.	4A, 4B
Digging Where Hazardous or Solid Waste was Located ORC 3734.02(H) Filling, grading, excavating, building, drilling, or mining on land where hazardous waste or solid waste facility was operated is prohibited without prior approval from the Director of the Ohio EPA.	Applicable	Pertinent to pose-remedial action institutional controls for alternatives that leave solid waste on site. (This requirement might be relevant and appropriate for those alternatives that is sufficiently similar to hazardous waste on site).	All
Ohio Water Well Standards OAC 3745-9-10 Abandonment of Test Holes and Wells Upon completion of testing, a test hole or well shall be either completely filled with grout or such material as will prevent contaminants from entering groundwater.	Applicable	Test borings and wells might be installed and/or closed as part of these remedial alternatives.	All
Permit to Install OAC 3745-31-05(A)(3) The director shall issue a permit to install if he determines that the installation or modification and operation of the air contaminant source will employ the best available technology.	Relevant and Appropriate	Although an administrative Permit to Install is not required for alternatives involving treatment, the substantive requirements of this section must be met by employing Best Available Technology (BAT) for treating particulate and off-gas emissions.	All

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
Restrictions on Particulate Emissions from Industrial Processes OAC 3745-17-11 This requirement established numerical emission release limits for particulate material from industrial sources. Any source (operation, process, or activity) shall be operated so that particulate emissions do not exceed allowable emission rates specified in this regulation (based on processing weights (Table 1) or uncontrolled mass rate of emissions (Figure II). A source complies with Table 1 requirements if its rate of particulate emission is always equal to or less than the allowable rate of particulate emission based on the maximum capacity of the source: Rate of Emission — Process Rate at Maximum Capacity (lb/hr) — Allowable Particulate (lb/hr)[1] 100 — 0.551 200 — 0.877 400 — 1.40 600 — 1.83 800 — 2.22 1000 — 2.58 [1] Excerpted from Table 1 of OAC 3745-17-1	Applicable	Treatment operations for various alternatives might result in release of particulate material which might exceed these standards.	All
10 CFR 1021.2 DOE actions must be subjected to NEPA evaluation as outlined by Council on Environmental Quality (CEQ) regulations in 40 CFR 1500-1508.	Applicable	This requirement is applicable because the FEMP is a DOE facility, and this requirement required NEPA evaluation for specific actions at DOE facilities.	All

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
40 CFR 264.1030 - 264.1036, Subpart AA Air Emission Standards for Process Vents	Relevant and Appropriate	No regulations have been promulgated for process vents associated with vitrification; however, 40 CFR 264.1030 - .0136 may be relevant and appropriate but not applicable to air emission standards for process vents associated with vitrification.	All
OAC 3745-15-07(A) Ohio Air Pollution Control Regulations Describes forms of air pollution nuisances and prohibits their emission or escape.	Applicable	Both excavation and waste treatment processes have the potential of generating prohibited fugitive emissions, including smoke, ashes, dust, dirt, grime, acids, fumes, gases, vapors, or odors in such a manner or in such amounts as to endanger health, safety, or welfare.	All
Ohio Administration Code 3745-17-08 Control of Fugitive Dust Requires the minimization or elimination of visible emissions of fugitive dust generated during grading, loading, or construction operations and other practices which emit fugitive dust.	Applicable	The implementation of remedial action alternatives will require the movement of dirt and other material likely to result in fugitive dust emissions. This requirement is relevant and appropriate because the FEMP is not located in an area subject to this regulation.	All
OAC 3745-21-02(C) OAC 3745-21-03(D) Ambient air quality standards and guidelines and Methods of ambient air quality measurements (for non-methane hydrocarbons). Mean ambient concentration of non-methane hydrocarbons not to exceed 160 $\mu g/m^3$ (0.24 ppm as carbon) between 6 and 9 a.m.; methods for determining ambient concentration of non-methane hydrocarbons.	Applicable	During drying, hydrocarbon soil contaminants may be evolved with the steam. An uncontrolled release could lead to violations of this standard.	All
OAC 3745-21-07 (G)(2) Control of emissions of organic material from stationary sources. Emissions of photochemical reactive material from processes, including drying, not to exceed 40 lbs/day, with a peak of 8 lbs/hour.	Applicable	Although the concentration of organic material in the pit waste is expected to be low, the volume of the waste to be treated could result in sufficient emissions for this standard to be violated if emissions are uncontrolled.	All

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
DOE Order 5400.1 @ p. iv - 1 Since each DOE facility is unique, the need and level of effort for monitoring programs shall be determined by the appropriate field organization on a case-by-case basis.	TBC	OU1 is part of a DOE facility and is subject to these orders.	All
DOE Order 5400.1 @ iv - 9 Groundwater that is or could be affected by DOE activities shall be monitored to determine and document the effects of operations on groundwater quality and quantity and to demonstrate compliance with DOE requirements and applicable Federal, State, and local laws and regulations.	TBC	OU1 is part of a DOE facility and is subject to these orders.	All
DOE Order 5400.1 @ iv - 10 Site-specific characteristics shall determine monitoring needs. Where appropriate, groundwater monitoring programs shall be designed and implemented in accordance with 40 CFR Part 264, Subpart F, or 40 CFR Part 265, Subpart F. For sites with multiple groundwater pollutant sources, extensive groundwater pollution or other unique site problems, groundwater monitoring programs could require more extensive information than those specified in 40 CFR Parts 264 and 265. Monitoring for radionuclides shall be in accordance with DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.	TBC	OU1 is part of a DOE facility and is subject to these orders.	All

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
DOE Order 5820.2A @ 1 Radioactive Waste Management Radioactive and mixed wastes shall be managed in a manner that assures protection of the health and safety of the public, DOE, and contractor employees, and the environment. The generation, treatment, storage, transportation, and/or disposal of radioactive wastes, and the other pollutants or hazardous substances they contain, shall be accomplished in a manner that minimizes the generation of such waste across program office functions and complies with all applicable Federal, State and local environmental, safety, and health laws and regulations and DOE requirements.	TBC	OU1 is part of a DOE facility and is subject to these orders.	All

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
DOE Order 5820.2A @ III - 1 - 2 Radioactive Waste Management Performance objectives for low-level waste disposal include the following: 1) Protect public health and safety in accordance with standards specified in applicable EH Orders and other DOE Orders. 2) Assure that external exposure to the waste and concentrations of radioactive material which may be released into surface water, groundwater, soil, plants and animals results in an effective dose equivalent that does not exceed 25 mrem/yr to any member of the public. Releases to the atmosphere shall meet the requirements of 40 CFR 61. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable. 3) Assure that the committed effective dose equivalents received by individuals who inadvertently may intrude into the facility after the loss of active institutional control (100 years) will not exceed 100 mrem/yr for continuous exposure or 500 mrem for a single acute exposure. 4) Protect groundwater resources, consistent with Federal, State, and local requirements.	TBC	OU1 is part of a DOE facility and is subject to these orders.	4A, 4B

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
DOE Order 5820.2A @ III - 9 - 10 Radioactive Waste Management Program Each operational or non-operational low-level waste disposal facility shall be monitored by an environmental monitoring program that conforms with DOE 5484.1 and, at a minimum, meets the requirements listed below: The environmental monitoring program shall be designed to measure: (a) operational effluent releases; (b) migration of radionuclides; (c) disposal unit subsidence; and (d) changes in disposal facility and disposal site parameters which may affect long-term site performance. Based on the characteristics of the facility being monitored, the environmental monitoring program may include, but not necessarily be limited to, monitoring surface soil, air, surface water, and, in the subsurface, soil and water, both in the saturated and the unsaturated zones. The monitoring program shall be capable of detecting changing trends in performance sufficiently in advance to allow application of any necessary corrective action prior to exceeding performance objectives. The monitoring program shall be able to ascertain whether or not effluents from each treatment, storage, or disposal facility or disposal site meets the requirements of applicable EH Orders.	TBC	OU1 is part of a DOE facility and is subject to these orders.	4A, 4B

TABLE F.4-1
(Continued)

Requirements	ARAR/TBC	Comments/Rationale	Alternative Number
DOE Order 5820.2A @ iv - 2 Radioactive Waste Management Program All DOE waste containing naturally occurring and accelerator produced radioactive material mixed with the RCRA hazardous chemicals shall be managed as hazardous waste under the RCRA. By-product 11e(2) (or a combination of 11e(2) by-product and naturally occurring and accelerator produced radioactive material) mixed with the RCRA hazardous chemicals, shall be managed consistent with both the RCRA and 40 CFR Part 192.	TBC	OU1 is part of a DOE facility and is subject to these orders.	4A, 4B
DOE 5820.2A III.3h Management of Low-Level Waste, Long-Term Storage Requires achieving performance objectives of DOE 5820.2A III.3a; requires records and documentation be maintained for low level waste in storage; permits storage of waste until disposal by approved methods.	TBC	The waste in OU1 is low level radioactive waste, subject to DOE orders.	All
40 CFR 122.26, Discharge of Storm Water Runoff Storm water runoff from landfills, construction sites, and industrial activities must be monitored and controlled.	Applicable	The requirement applies to all industrial waste sites and construction sites greater than 5 acres that discharge storm runoff to the waters of the United States. A Notice of Intent must be filed for construction of such sites. Remedial activities at OU1 may disturb more than 5 acres of land.	All

TABLE F.4-2

COMPLIANCE STATUS OF ALTERNATIVES WITH ACTION-SPECIFIC ARARS

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
Applicable Federal and State ARARs			
OAC 3745-15-07 Prevention of Air Pollution Nuisance	Fugitive Dust and blowing dust carrying contamination would be controlled on active excavation faces and spoil piles by wetting, fogging, or misting. Dust from inactive excavation faces would be controlled with plastic, applied foam, shotcrete, or paving. Crushing and drying activities would take place in enclosures. This alternatives should provide compliance with OAC 3745-15-07.	Fugitive Dust and blowing dust carrying contamination would be controlled on active excavation faces and spoil piles by wetting, fogging, or misting. Dust from inactive excavation faces would be controlled with plastic, applied foam, shotcrete, or paving. Crushing and drying activities would take place in enclosures. This alternatives should provide compliance with OAC 3745-15-07.	Fugitive Dust and blowing dust carrying contamination would be controlled on active excavation faces and spoil piles by wetting, fogging, or misting. Dust from inactive excavation faces would be controlled with plastic, applied foam, shotcrete, or paving. Crushing and drying activities would take place in enclosures. These alternatives should provide compliance with OAC 3745-15-07.
OAC 3745-17-08 Ohio Ambient Air Quality Standards	Fugitive Dust and blowing dust carrying contamination would be controlled on active excavation faces and spoil piles by wetting, fogging, or misting. Dust from inactive excavation faces would be controlled with plastic, applied foam, shotcrete, or paving. Crushing and drying activities would take place in enclosures. These measures should provide compliance with the OAC 3745-17-08.	Fugitive Dust and blowing dust carrying contamination would be controlled on active excavation faces and spoil piles by wetting, fogging, or misting. Dust from inactive excavation faces would be controlled with plastic, applied foam, shotcrete, or paving. Crushing and drying activities would take place in enclosures. These measures should provide compliance with the OAC 3745-17-08.	Fugitive Dust and blowing dust carrying contamination would be controlled on active excavation faces and spoil piles by wetting, fogging, or misting. Dust from inactive excavation faces would be controlled with plastic, applied foam, shotcrete, or paving. Crushing and drying activities would take place in enclosures. These measures should provide compliance with the OAC 3745-17-08.

TABLE F.4-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
OAC 3745-21-02(C) and OAC 3745-21-03(D), Ambient Air Quality Standards and Guidelines and Methods of Ambient Air Quality Measurements (for non-methane hydrocarbons)	Process off-gases will be treated through a condenser and a scrubber during drying and treatment. The methods proposed in the Operational Scenario for On-Site Disposal should provide compliance with OAC 3745-21-02(C) and OAC 3745-21-03(D).	Process off-gases will be treated through a condenser and a scrubber during drying and treatment. The methods proposed in the Operational Scenario for On-Site Disposal should provide compliance with OAC 3745-21-02(C) and OAC 3745-21-03(D).	Process off-gases will be treated through a condenser and a scrubber during drying. The methods proposed in the Operational Scenario for Off-Site Disposal should provide compliance with OAC 3745-21-02(C) and OAC 3745-21-03(D).
OAC 3745-21-07(G)(2), Control of Emissions of Organic Material From Stationary Sources	The most recent data from the RI indicate that VOCs do not need to be controlled due to their low concentrations. However off-gases will be treated through a condenser and scrubber during drying and treatment. The methods described in the Operational Scenario for On-site Disposal for controlling off-gas emissions would adequately comply with OAC 3745-21-07(G)(2).	The most recent data from the RI indicate that VOCs do not need to be controlled due to their low concentrations. However off-gases will be treated through a condenser and scrubber during drying and treatment. The methods described in the Operational Scenario for On-site Disposal for controlling off-gas emissions would adequately comply with OAC 3745-21-07(G)(2).	The most recent data from the RI indicate that VOCs do not need to be controlled due to their low concentrations. However off-gases will be treated through a condenser and scrubber during drying. The methods described in the Operational Scenario for Off-Site Disposal for controlling off-gas emissions would adequately comply with OAC 3745-21-07(G)(2).
Relevant and Appropriate Federal ARARs			

TABLE F.4-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
40 CFR 192.02 Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings	This alternative would provide compliance with the requirement for long-term stability because the disposal of vitrified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.02.	This alternative would provide compliance with the requirement for long-term stability because the disposal of solidified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.02.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
40 CFR 192.20 Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings	DOE should be able to provide the necessary documentation and modeling results to provide assurance that the requirements of 40 CFR 192.02 are met.	DOE should be able to provide the necessary documentation and modeling to provide assurance that the requirements of 40 CFR 192.02 are met.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility operating and reporting requirements are not ARARs for these alternatives.
40 CFR 192.20(a)(1) Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings	This alternative would provide compliance with the requirement for long-term stability because the disposal of vitrified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.20 (a)(1).	This alternative would provide compliance with the requirement for long-term stability because the disposal of solidified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.20 (a)(1).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABLE F.4-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
40 CFR 192.20(a)(2) Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings	The monitoring program for an on-site disposal cell would provide background groundwater monitoring data. This alternative should provide compliance with 40 CFR 192.20 (a)(2).	The monitoring program for an on-site disposal cell would provide background groundwater monitoring data. This alternative should provide compliance with 40 CFR 192.20 (a)(2).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility operating and monitoring requirements are not ARARs for these alternatives.
40 CFR 192.32(b) Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings, Closure Performance Standards.	This alternative would provide compliance with the requirement for long-term stability because the disposal of vitrified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.32 (b).	This alternative would provide compliance with the requirement for long-term stability because the disposal of solidified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.32 (b).	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
40 CFR 192.41 Federal Health and Environmental Standards for Uranium and Thorium Mill Tailings, Closure Performance Standards for Thorium	This alternative would provide compliance with the requirement for long-term stability because the disposal of vitrified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.41.	This alternative would provide compliance with the requirement for long-term stability because the disposal of solidified waste in an on-site disposal cell will be designed to remain protective of public health and the environment for 1000 years. This alternative should provide compliance with 40 CFR 192.41.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABLE F.4-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
40 CFR 241, Subpart B (OAC 3745-27), RCRA Subtitle D On-site Solid Nonhazardous Waste Management Facilities Design standards are presented in the following citations: 241.200-2, 241.201-2, 241.202-2, 241.203-2, 241.204-2, 241.205-2, 241.206-2, 241.207-2, 241.208-2, 241.209-2, and 241.210-2.	The Operational Scenario for On-Site Disposal describes the design of the on-site disposal cell. The design contains a double liner, leachate collection and monitoring system, and leak detection and containment system. This alternative should provide compliance with 40 CFR 241, Subpart B and OAC 3745-27.	The Operational Scenario for On-Site Disposal describes the design of the on-site disposal cell. The design contains a double liner, leachate collection and monitoring system, and leak detection and containment system. This alternative should provide compliance with 40 CFR 241, Subpart B and OAC 3745-27.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
40 CFR 264, Subpart G	This alternative would comply with Closure and Post-closure requirements for HWMUs.	This alternative would comply with Closure and Post-closure requirements for HWMUs.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.
40 CFR 264, Subpart S	This alternative would comply with the CAMU & TU requirements.	This alternative would comply with the CAMU & TU requirements.	These alternatives involve off-site shipment of OU1 pit wastes. On-site facility design requirements are not ARARs for these alternatives.

TABLE F.4-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
40 CFR 264.1030 - 264.1036, Subpart AA Air Emission Standards for Process Vents	Water vapor from the vitrification process will pass through a quencher/ scrubber, then through a mist eliminator to remove entrained water droplets. The quencher/scrubber will remove most regulated substances from the vitrification off-gases. The off gases will then pass through a prefilter and a HEPA filter. Emissions will be monitored in accordance with regulatory requirements. The methods used to implement this alternative should provide compliance with OAC 3745-17-08 and the Clean Air Act.	Water vapor from the vitrification process will pass through a quencher/ scrubber, then through a mist eliminator to remove entrained water droplets. The quencher/scrubber will remove most regulated substances from the vitrification off-gases. The off gases will then pass through a prefilter and a HEPA filter. Emissions will be monitored in accordance with regulatory requirements. This alternative should provide compliance with OAC 3745-17-08 and the Clean Air Act.	Water vapor from the vitrification process will pass through a quencher/ scrubber, then through a mist eliminator to remove entrained water droplets. The quencher/scrubber will remove most regulated substances from the vitrification off-gases. The off gases will then pass through a prefilter and a HEPA filter. Emissions will be monitored in accordance with regulatory requirements. This alternative should provide compliance with OAC 3745-17-08 and the Clean Air Act.

TABLE F.4-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
40 CFR 265.370-383, Subpart P Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Thermal Treatment	Water vapor from the vitrification process will pass through a quencher/ scrubber, then through a mist eliminator to remove entrained water droplets. The quencher/scrubber will remove most regulated substances from the vitrification off-gases. The off gases will then pass through a prefilter and a HEPA filter. The methods used to implement this alternative should provide compliance with 40 CFR 265.370-383.	Water vapor from the vitrification process will pass through a quencher/ scrubber, then through a mist eliminator to remove entrained water droplets. The quencher/scrubber will remove most regulated substances from the vitrification off-gases. The off gases will then pass through a prefilter and a HEPA filter. This alternative should provide compliance with 40 CFR 265.370-383.	Water vapor from the vitrification process will pass through a quencher/ scrubber, then through a mist eliminator to remove entrained water droplets. The quencher/scrubber will remove most regulated substances from the vitrification off-gases. The off gases will then pass through a prefilter and a HEPA filter. This alternative should provide compliance with 40 CFR 265.370-383.
To-Be-Considered Guidance			
DOE Order 5400.5 @ 2 Radiation Protection of the Public and the Environment	The engineering practices that would be implemented for controlling air emissions and fugitive dust for excavation, drying, vitrification, and the conservative design proposed for the on-site landfill all provide compliance with the intent and limits sets in DOE Order 5400.5 @ 2.	The engineering practices that would be implemented for controlling air emissions and fugitive dust for excavation, drying, cementation, and the conservative design proposed for the on-site landfill all provide compliance with the intent and limits sets in DOE Order 5400.5 @ 2.	The engineering practices that would be implemented for controlling air emissions and fugitive dust for excavation, drying, and the proposed handling of waste for off-site transport provide compliance with the intent and limits sets in DOE Order 5400.5 @ 2.

TABLE F.4-2
(Continued)

Requirements	Alternative 4A	Alternative 4B	Alternative 5A & 5B
DOE Order 5480.11, Radiation Protection for Occupational Workers	The engineering practices that would be implemented for controlling air emissions and fugitive dust for excavation, drying, vitrification, and the conservative design proposed for the on-site landfill Provide compliance with the intent and limits sets in DOE Order 5480.11.	The engineering practices that would be implemented for controlling air emissions and fugitive dust for excavation, drying, cementation, and the conservative design proposed for the on-site landfill all provide compliance with the intent and limits sets in DOE Order 5480.11.	The engineering practices that would be implemented for controlling air emissions and fugitive dust for excavation, drying, and the proposed handling of waste for off-site transport provide compliance with the intent and limits sets in DOE Order 5480.11.
40 CFR 122.26, Discharge of Storm Water Runoff	Engineering practices would be implemented to monitor and control storm water runoff during removal, treatment, and disposal. This alternative is expected to comply with 40 CFR 122.26.	Engineering practices would be implemented to monitor and control storm water runoff during removal, treatment, and disposal. This alternative is expected to comply with 40 CFR 122.26.	Engineering practices would be implemented to monitor and control storm water runoff during removal, treatment, and disposal. This alternative is expected to comply with 40 CFR 122.26.

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F.5.0 OTHER REQUIREMENTS FOR OPERABLE UNIT 1 REMEDIAL ACTION ALTERNATIVES

Table F.5-1 lists several requirements that are not technically environmental laws and thus not ARARs for remedial actions at Operable Unit 1. These requirements will have to be complied with as a matter of law or contract. Worker safety regulations apply to all federal tasks, for example, and procurement and transportation laws will apply on or off a CERCLA site.

TABLE F.5-1

OTHER REQUIREMENTS FOR OPERABLE UNIT 1 REMEDIAL ACTION ALTERNATIVES*

Title	Requirement	Rationale for Implementation
29 CFR 1904 and 1910, OSHA Worker Protection Requirements	These regulations establish requirements to protect workers who could be exposed to radiation, noise, hazardous wastes, or other contaminants or hazards at the remediation site.	OU1 is a remediation site under CERCLA. Compliance with 29 CFR 1910.120 is required for all sites undergoing remediation by 40 CFR 300.150.
23 USC 127, Highway Improvement Act of 1982	Establishes vehicle weight limits for interstate highways.	Applicable to those alternatives which involve transportation of the waste materials off site.
NTS Waste Acceptance Criteria	Establishes the wastes that can be disposed at the facility.	NTS's acceptance criteria would be applicable to disposal at the NTS. NTS operates under DOE Order 5820.2A, "Radioactive Waste Management".
7 USC 4210 et. seq., Farmland Protection Policy Act	Requires protection and maintenance of farmland for its beneficial use as national resource.	The site of OU1 remedial actions will not affect farmland. Nevertheless the law remains applicable to CERCLA actions. OU1 remedial actions should be able to comply with the law.
49 CFR 171-173, 177, 178 DOT Requirements for Transportation of Hazardous Materials	No one may transport hazardous materials on public highways except in accordance with these regulations: Part 171 General requirements Part 172 This part establishes shipping papers, marking, labeling, placarding, and emergency response information requirements. Part 173 This part establishes packaging and other shipping requirements for hazardous materials, including radioactive materials. Part 177 Requirements of the transporter Part 178 Specifications for shipping containers	Applicable to those alternatives which involve transportation of the waste materials off site. Radioactive materials and materials sufficiently similar to hazardous wastes might be shipped off site.

TABLE F.5-1
(Continued)

Title	Requirement	Rationale for Implementation
49 USC 1801-1812 Hazardous Materials Transportation Act	Establishes requirements for minimizing environmental impacts of spills or releases of hazardous materials.	Applicable to those alternatives which involve transportation of the waste materials off site. Radioactive materials and materials sufficiently similar to hazardous wastes might be shipped off site.
5400.3	Hazardous and Mixed Waste Program	Contractual obligation for activities at DOE facilities.
5440.1E	NEPA Compliance Program	Contractual obligation for activities at DOE facilities.
5480.1B	Environmental, Safety, and Health Program for DOE Operations	Contractual obligation for activities at DOE facilities.
5480.3A	Hazardous Materials Packaging and Transportation Safety	Contractual obligation for activities at DOE facilities.
5480.4	Environmental Protection, Safety, and Health Protection Standards	Contractual obligation for activities at DOE facilities.
5483.1A	Occupational Safety and Health Programs for DOE Employees at Government-Owned, Contractor-Operated Facilities	Contractual obligation for activities at DOE facilities.
5700.6C	Quality Assurance	Contractual obligation for activities at DOE facilities.
6430.1A	General Design Criteria	Contractual obligation for activities at DOE facilities.

*These other requirements are not technically ARARs or TBCs since they are not environmental regulations or guidance subject to waiver, but must be complied with whenever they pertain to the location or activity.

REFERENCES

U.S. Environmental Protection Agency (EPA), August 1988, "CERCLA Compliance with Other Laws Manual: Interim Final," EPA/54016-89006.

U.S. Environmental Protection Agency (EPA), July 1989, "Overview of RCRA Land Disposal Restrictions (LDRs)," EPA Superfund LDR Guide #1, 9347.3-01FS.

U.S. Environmental Protection Agency (EPA), August 1990, "Determining when Land Disposal Restrictions (LDRs) are Applicable to CERCLA Response Actions," EPA Superfund LDR Guide #5, OSWER 9347.3-05FS.

ATTACHMENT I TO APPENDIX F
OF THE OPERABLE UNIT 1 FEASIBILITY STUDY

CHEMICAL-SPECIFIC
FEDERAL AND STATE ARARS TABLES

TABLE I-1

FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS FOR INORGANIC CONTAMINANTS OF CONCERN IN OPERABLE UNIT 1

Contaminants of Concern	Affected Media	Federal MCLs	State of Ohio MCLs	Citation
Antimony	Drinking water	0.006 mg/L	0.006 mg/L	OAC 3745-81-11 Maximum Contaminant Level for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Level for Inorganic Chemicals
Arsenic	Drinking water	0.05 mg/L	0.05 mg/L	OAC 3745-81-11 Maximum Contaminant Level for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Level for Inorganic Chemicals
Barium	Drinking water	2.0 mg/L	1.0 mg/L	OAC 3745-81-11 Maximum Contaminant Level for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Level for Inorganic Chemicals
Beryllium	Drinking water	0.004 mg/L	0.004 mg/L	OAC 3745-81-11 Maximum Contaminant Level for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Level for Inorganic Chemicals
Cadmium	Drinking water	0.005 mg/L	0.010 mg/L	OAC 3745-81-23 Inorganic Chemical Monitoring Requirements 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals
Chromium	Drinking water	0.1 mg/L	0.05 mg/L	OAC 3745-81-23 Inorganic Chemical Monitoring Requirements 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals

TABLE I-1
(Continued)

Contaminants of Concern	Affected Media	Federal MCLs	State of Ohio MCLs	Citation
Copper and compounds	Water systems and drinking water	The copper action level is exceeded if the concentration of copper in more than 10% of the tap water samples collected is greater than 1.3 mg/L.	1.0 mg/L (Ohio SMCL)	40 CFR 141.80, Subpart I Control of Lead and Copper Only because lead and copper are contaminants of concern at OU1 and have the potential to migrate into an aquifer which supplies drinking water to a community. OAC 3745-82-02, Secondary Maximum Contaminant Levels 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals
Cyanide	Drinking water	0.2 mg/L	0.2 mg/L	OAC 3745-81-11 Maximum Contaminant Level for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals
Lead	Drinking water	0.05 mg/L	0.005 mg/L	OAC 3745-81-11 Maximum Contaminant Levels for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals
Lead	Water systems and drinking water	Lead action level is exceeded if the concentration of lead in more than 10% of tap water samples collected is greater than .015 mg/L		40 CFR 141.80, Subpart I Control of Lead and Copper Only because lead and copper are contaminants of concern at OU1 and have the potential to migrate into an aquifer which supplies drinking water to a community.
Mercury	Drinking water	0.002 mg/L	0.002 mg/L	OAC 3745-81-11 Maximum Contaminant Level for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals

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TABLE I-1
(Continued)

Contaminants of Concern	Affected Media	Federal MCLs	State of Ohio MCLs	Citation
Selenium	Drinking water	0.05 mg/L	0.05 mg/L	OAC 3745-81-11 Maximum Contaminant Levels for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals
Thallium	Drinking water	0.002 mg/L	0.002 mg/L	OAC 3745-81-11 Maximum Contaminant Levels for Inorganic Chemicals 40 CFR 141.62 Maximum Contaminant Levels for Inorganic Chemicals

TABLE I-2

FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS FOR ORGANIC CONTAMINANTS OF CONCERN AT OPERABLE UNIT 1

Contaminants of Concern	Media	Federal MCLs	State of Ohio MCLs	Citation
Benzo(a)anthracene	Community and non-transient and non-community water systems	0.0001 mg/L Proposed MCL		Drinking Water Regulations and Health Advisories by the Office of Water, U.S. EPA, Washington, D.C., May 1993 40 CFR 141.61 National Primary Drinking Water Rules OAC 3745-81-14 Public Water System Primary Contaminant Control
Benzo(a)pyrene	Community and non-transient and non-community water systems	0.0002 mg/L	0.0002 mg/L	
Benzo(b)fluorathene	Community and non-transient and non-community water systems	0.0002 mg/L Proposed MCL		
Chrysene	Community and non-transient and non-community water systems	0.0002 mg/L Proposed MCL		
Indeno(1,2,3-cd)pyrene	Community and non-transient and non-community water systems	0.0004 mg/L Proposed MCL		
Polychlorinated biphenyls (PCBs)	Community and non-transient and non-community water systems	0.0005 mg/L	0.0005 mg/L	
Tetrachloroethylene	Community and non-transient and non-community water systems	0.005 mg/L	0.005 mg/L	
Vinyl chloride	Community and non-transient and non-community water systems	0.002 mg/L	0.002 mg/L	

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TABLE I-3

FEDERAL AND STATE MAXIMUM CONTAMINANT LEVELS FOR RADIOACTIVE CONTAMINANTS OF CONCERN AT OPERABLE UNIT 1

Contaminants of Concern	Media	Federal MCLs	State of Ohio MCLs	Citation
Combined radium-226/228	Community water systems	5 pCi/l	5 pCi/l	40 CFR 141.15 National Primary Drinking Water Rules OAC 3745-81-15 Public Water System Primary Contaminant Control
Combined radium-226/228	Community water systems	5×10^{-9} μCi/ml	--	DOE Order 5400.5 Radiation Protection of the Public and the Environment
Gross alpha particle activity excluding uranium and radon	Community water systems		15 pCi/l	40 CFR 141.15 National Primary Drinking Water Rules OAC 3745-81-15 Public Water System Primary Contaminant Control
Gross alpha particle activity providing uranium and radon	Community water systems	1.5×10^{-8} μCi/ml		DOE Order 5400.5 Radiation Protection of the Public and the Environment
Beta particle and photon radioactivity from manmade radionuclides	Community water systems	Average annual concentration in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 mrem/yr.		40 CFR 141.16 National Primary Drinking Water Rules OAC 3745-81-16 Public Water System Primary Contaminant Control

TABLE I-4

GROUNDWATER PROTECTION STANDARDS AND CONCENTRATION LIMITS

Contaminants of Concern	Media	Federal Concentration Limits (mg/L)	State Concentration Limits (mg/L)	Citation
Arsenic	Groundwater	0.05 mg/L	0.05 mg/L	OAC 3745-54-92 Groundwater Protection Standards for Hazardous Waste Facilities 40 CFR 264.94, Subpart F Concentration Limits
Barium	Groundwater	1.0 mg/L	1.0 mg/L	
Cadmium	Groundwater	0.01 mg/L	0.01 mg/L	
Chromium	Groundwater	0.05 mg/L	0.05 mg/L	
Lead	Groundwater	0.05 mg/L	0.05 mg/L	
Selenium	Groundwater	0.01 mg/L	0.01 mg/L	
Silver	Groundwater	0.05 mg/L	0.05 mg/L	
Inorganics general	Groundwater	Not to exceed background level of the constituent in the groundwater at the time the limit is specified in the permit		OAC 3745-54-92 Groundwater Protection Standards for Hazardous Waste Facilities
Hazardous substances	Groundwater	Not to exceed background level of the constituent in the groundwater at the time the limit is specified in the permit		
Hazardous substances	Groundwater	If background level of constituent is below limits set above, then the concentration of the constituent must not exceed an alternate limit established in the permit		

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TABLE I-5

NUMERICAL AND NARRATIVE CRITERIA FOR WARM WATER AQUATIC HABITATS BOTH INSIDE AND OUTSIDE THE MIXING ZONE

Contaminants of Concern	Concentration Limits Inside the Mixing Zone	Concentration Limits Outside the Mixing Zone	Citation
Acenaphthene	134 μg/L	67 μg/L	OAC 3745-1-07 Ohio Water Quality Standards
Antimony	1,300 μg/L	650 μg/L	
Arsenic	720 μg/L	360 μg/L	
Cyanide	92 μg/L	46 μg/L	
Fluoranthene	400 mg/L	200 mg/L	
Naphthalene	320 μ/l	160 μg/L	
4-Nitrophenol	1,600 μg/L	790 mg/L	
Selenium	40 μg/L	20 μg/L	
Tetrachloroethylene	3,400 μg/L	1,700 μg/L	
Thallium	140 μg/L	71 μg/L	

TABLE I-6

NUMERICAL AND NARRATIVE CONCENTRATIONS IN MAXIMUM 30-DAY AVERAGE CONCENTRATIONS

Contaminants of Concern	30-day Average Max. Concentrations: Public Water Supply	30-day Average Max. Concentrations: Warm Water Aquatic Habitat	30-day Average Maximum Concentrations: Human Health	30-day Average Maximum Concentrations: Agricultural Use Water	Citation
Acenaphthene	20 μg/L	67 μg/L			OAC 3745-1-07, Table 7-1 Ohio Water Quality Standards
Antimony	14 μg/L	190 μg/L	4,300 μg/L		
Arsenic	50 μg/L	190 μg/L		100 μg/L	
Asbestos	300,000 fiber/l				
Barium	1,000 μg/L				
Cyanide	200 μg/L	12 μg/L			
D,D,T		0.001 μg/L	0.00024 μg/L		
Fluoranthene	42 μg/L	8.9 μg/L	54 μg/L		
Naphthalene		44 μg/L			
4-Nitrophenol		35 μg/L			
PAHs:					
Benzo(a)anthracene	0.028 μg/L		0.31 μg/L		
Benzo(a)pyrene	0.028 μg/L		0.31 μg/L		
Benzo(g,h,i)perylene	0.028 μg/L		0.31 μg/L		
Benzo(k)fluoranthene	0.028 μg/L		0.31 μg/L		
PCBs		0.001 μg/L	0.00079 μg/L		
Pentachlorophenol	1,000 μg/L				
Selenium	10 μg/L	5.0 μg/L		50 μg/L	
Tetrachloroethylene	320 μg/L	73 μg/L	3,500 μg/L		
Thallium	13 μg/L	16 μg/L	48 μg/L		
Vinyl Chloride	2.0 μg/L	5,250 μg/L			

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TABLE I-7

OUTSIDE MIXING ZONE MAXIMUM CRITERIA FOR WATER HARDNESS DEPENDENT CONTAMINANTS IN WARM WATER AQUATIC HABITATS

Contaminants of Concern	Water Hardness (mg/L $CaCO_3$)									Citation
	100	150	200	250	300	350	400	450	500	
Beryllium	520	1,000	1,600	2,300	3,100	3,900	4,900	5,900	7,000	OAC 3745-1-07, Table 7-10 Ohio Water Quality Standards
Cadmium	5.6	8.7	12	15	19	22	25	29	32	
Copper	18	27	36	45	54	63	72	81	90	
Chromium	1,800	2,500	3,200	3,800	4,400	5,000	5,600	6,200	6,700	
Lead	130	220	320	430	540	650	780	900	1,000	
Nickel	1,600	2,200	2,900	3,500	4,100	4,600	5,200	5,800	6,300	
Silver	1.6	3.2	5.3	7.7	11	14	17	21	25	
Zinc	120	160	210	250	300	340	380	420	450	

TABLE I-8

OUTSIDE MIXING ZONE 30-DAY AVERAGE CRITERIA FOR WATER HARDNESS DEPENDENT CONTAMINANTS IN WARM WATER AQUATIC HABITATS

Contaminants of Concern	Water Hardness (mg/L $CaCO_3$)									Citation
	100	150	200	250	300	350	400	450	500	
Beryllium	23	45	71	100	140	170	220	260	310	OAC 3745-1-07, Table 7-11 Ohio Water Quality Standards
Cadmium	1.4	1.9	2.4	2.9	3.3	3.7	4.1	4.5	4.9	
Copper	12	17	22	27	32	37	42	47	52	
Chromium	210	290	370	440	510	580	640	710	770	
Lead	6.9	12	17	22	28	34	41	47	54	
Nickel	170	250	320	380	450	520	580	640	700	
Zinc	110	150	190	230	270	300	340	380	410	

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TABLE I-9

INSIDE MIXING ZONE MAXIMUM CRITERIA FOR WATER HARDNESS DEPENDENT CONTAMINANTS IN WARM WATER AQUATIC HABITATS

Contaminants of Concern	Water Hardness (mg/L $CaCO_3$)									Citation
	100	150	200	250	300	350	400	450	500	
Beryllium	1,000	2,000	3,000	4,600	6,100	7,800	9,700	12,000	14,000	OAC 3745-1-07, Table 7-12 Ohio Water Quality Standards
Cadmium	11	17	24	30	37	44	51	58	65	
Copper	35	53	71	89	110	130	140	160	180	
Chromium	3,600	5,000	6,400	7,600	8,900	10,000	11,000	12,000	13,000	
Lead	260	440	640	850	1,100	1,300	1,600	1,800	2,100	
Nickel	3,100	4,400	5,700	6,900	8,100	9,300	10,000	12,000	13,000	
Silver	3.2	6.4	11	15	21	28	35	42	51	OAC 3745-1-07, Table 7-12 Ohio Water Quality Standards
Zinc	230	330	420	510	590	670	750	830	910	

TABLE I-10

OUTSIDE MIXING ZONE MAXIMUM CRITERIA FOR PH DEPENDENT PARAMETERS IN WARM WATER AQUATIC HABITATS

Contaminants of Concern	Water pH						Citation
	6.5	7.0	7.5	8.0	8.5	9.00	
Pentachlorophenol	5.3	8.7	14	24	39	65	OAC 3745-1-07, Table 7-14 Ohio Water Quality Standards

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TABLE I-11

INSIDE MIXING ZONE MAXIMUM CRITERIA FOR PH DEPENDENT PARAMETERS IN WARM WATER AQUATIC HABITATS

Contaminants of Concern	Water pH						Citation
	6.5	7.0	7.5	8.0	8.5	9.0	
Pentachlorophenol	11	17	29	48	79	130	OAC 3745-1-07, Table 7-15 Ohio Water Quality Standards

TABLE I-12

LOWER GREAT MIAMI RIVER TEMPERATURE CRITERIA IN DEGREES FAHRENHEIT[a]

Months	Average Temperatures	Daily Maximums	Citation
January 1-31	47 (8.3)	52 (11.1)	OAC 3745-1-07 Ohio Water Quality Standards
February 1-29	47 (8.3)	52 (11.1)	
March 1-15	51 (10.0)	56 (13.3)	
March 16-31	54 (12.2)	59 (15.0)	
April 1-15	59 (15.0)	65 (18.3)	
April 16-30	65 (18.3)	70 (21.1)	
May 1-15	67 (19.4)	73 (22.8)	
May 16-31	70 (21.1)	76 (24.4)	
June 1-15	74 (23.3)	80 (26.7)	
June 16-30	82 (27.8)	85 (29.4)	
July 1-31	85 (29.4)	89 (31.7)	
August 1-31	85 (29.4)	89 (31.7)	
September 1-15	85 (29.4)	89 (31.7)	
September 16-30	78 (25.6)	83 (28.3)	
October 1-15	71 (21.7)	76 (24.4)	
October 16-31	66 (18.9)	71 (21.7)	
November 1-30	63 (17.2)	68 (20.0)	
December 1-31	49 (9.4)	54 (12.2)	

[a]Degrees Centigrade are in parentheses

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TABLE I-13

DERIVED CONCENTRATION GUIDES (DCGS) FOR MEMBERS OF THE PUBLIC FROM INHALATION RESULTING IN 100 MREM/YEAR

Contaminants of Concern	Gastrointestinal Tract Absorption Factors	Media	Inhaled Air DCGs (μCi/ml)			Citation
			D	W	Y	
Cs-137	1.0	Air	4×10^{-10}	--	--	DOE Order 5400.5 Radiation Protection of the Public and the Environment
Np-237	1×10^{-3}	Air	--	2×10^{-14}	--	
Pu-238	1×10^{-3}	Air	--	3×10^{-14}	--	
	1×10^{-5}	Air	--	--	4×10^{-14}	
Pu-239/240	1×10^{-3}	Air	--	2×10^{-14}	--	
	1×10^{-5}	Air	--	--	4×10^{-14}	
Ra-226	2×10^{-1}	Air	1×10^{-7}	--	1×10^{-12}	
Ra-228	2×10^{-1}	Air	1×10^{-7}	--	3×10^{-12}	
Ru-106	5×10^{-2}	Air	2×10^{-10}	1×10^{-10}	3×10^{-11}	
Sr-90	3×10^{-1}	Air	5×10^{-11}	--	--	
	1×10^{-2}	Air	--	--	9×10^{-12}	
Tc-99	--	Air	--	--	--	
Th-228	2×10^{-4}	Air	--	5×10^{-14}	4×10^{-14}	
Th-230	2×10^{-4}	Air	--	4×10^{-14}	5×10^{-14}	
Th-232	2×10^{-4}	Air	--	7×10^{-15}	1×10^{-14}	
U-234	5×10^{-2}	Air	4×10^{-12}	2×10^{-12}	--	
	2×10^{-3}	Air	--	--	9×10^{-14}	
U-235	5×10^{-2}	Air	5×10^{-12}	2×10^{-12}	--	DOE Order 5400.5 Radiation Protection of the Public and the Environment
	2×10^{-3}	Air	--	--	1×10^{-13}	
U-238	5×10^{-2}	Air	5×10^{-12}	2×10^{-12}	--	Final determination of RCRA hazardous by legal definitions
	2×10^{-3}	Air	--	--	1×10^{-13}	Listed description not applied unless a legal RCRA waste

TABLE I-14

FEDERAL AND STATE TREATMENT STANDARDS FOR THE INORGANIC CONTAMINANTS OF CONCERN IN OPERABLE UNIT 1

Inorganic Chemicals of Concern		Affected Media	Federal Treatment Standards (mg/L)	State[a] Treatment Standards (mg/L)	Citation
Antimony	F039	Waste Treatment residue Debris Soil	0.23	--	40 CFR 268.4 EPA Regulations on Land Disposal Restrictions OAC 3745-59-41 Ohio Hazardous Waste Management Regulation
Arsenic	D004		5.0	5.0	
Barium	D005		100.0	100.0	
Cadmium	D006		1.0	1.0	
Chromium	D007		5.0	5.0	
Cyanide	F039		1.8	1.8	
Lead	D008		5.0	5.0	
Selenium	D010		5.7	5.7	
Silver	D011		5.0	5.0	

[a]State of Ohio

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TABLE I-15

LAND DISPOSAL RESTRICTIONS FOR SOLVENTS APPLICABLE TO CONTAMINANTS OF CONCERN IN OPERABLE UNIT 1

Solvent Wastes of Concern	Affected Media	Federal Treatment Standards (mg/L)	State[a] Treatment Standards (mg/L)	Citation
Acenaphthene F039	Waste Treatment residue Debris Soil	4.0	4.0	40 CFR 268.30 EPA Regulations on Land Disposal OAC 3745-59-30 Ohio Hazardous Waste Management Regulations
Acenapthylene F039		3.4	3.4	
Dichlorodifluoromethane F039		7.2	7.2	
Fluorene F039		4.0	4.0	
4-Nitrophenol F039		29.0	29.0	
Tetrachloroethane F001		6.0	6.0	
Tetrachloroethylene F039		5.6	5.6	

[a]State of Ohio

TABLE I-16

LAND DISPOSAL RESTRICTIONS ON CALIFORNIA-LISTED WASTES THAT ARE APPLICABLE TO CONTAMINANTS OF CONCERN IN OPERABLE UNIT 1

California-Listed Waste Constituents of Concern HOCs AND PCBs	Affected Media	Federal Treatment Standards (mg/L)	State Treatment Standards (mg/kg)	Citation
Benzo(a)anthracene	Waste Treatment residue Debris Soil	8.2	8.2	40 CFR 268.30 EPA Regulations on Land Disposal Restrictions OAC 3745-59-30 Ohio Hazardous Waste Management Regulation
Benzo(a)pyrene		8.2	8.2	
Benzo(b)fluoranthene		3.4	3.4	
Benzo(g,h,i)perylene		1.5	1.5	
Benzo(k)fluoranthene		3.4	3.4	
Chrysene		8.2	8.2	
Dibenzo(a,h)anthracene		8.2	8.2	
Fluoranthene		8.2	8.2	
Indeno(1,2,3-cd)pyrene		8.2	8.2	
pH		Prohibits <2	Prohibits <2	
PCBs Aroclor-1221 (F039) Aroclor-1254 (F039) Aroclor-1248 (F039) Aroclor-1260 (F039)		Liquid hazardous wastes containing PCBs at concentrations ≥50 ppm but <500 ppm shall be incinerated in accordance with the technical requirements of 40 CFR 761.70 or burned in high-efficiency boilers in accordance with 40 CFR 761.70.	Liquid hazardous waste containing PCBs at concentrations ≥500 ppm shall be incinerated in accordance with the technical requirements of 40 CFR 761.70. Thermal treatment shall be in compliance with all applicable rules. OAC 3745-54 to 3745-58 OAC 3745-65 to 3745-69	
Non-liquid HOCs	Waste Treatment residue Debris Soil		In concentrations greater than or equal to 1000 mg/kg and liquid HOC containing wastes that are prohibited shall be incinerated in accordance with the requirements of rules: OAC 3745-57-40 to -51 or OAC 3745-68-40 to -52	OAC 3745-59-42 Ohio Hazardous Waste Management Regulation CFR 268.42 EPA Regulations on Land Disposal

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LAND DISPOSAL RESTRICTIONS FOR OTHER ORGANIC CONTAMINANTS OF CONCERN IN OPERABLE UNIT 1

Organic Contaminants of Concern	Affected Media	Federal Treatment Standards	State Treatment Standards	Citation
Dibenzofuran	Waste Treatment residue Debris Soil	--	--	40 CFR 268.41 EPA Regulation on Land Disposal Restrictions OAC 3745-59-43 Ohio Hazardous Waste Regulations
Phenanthrene		3.1 mg/L	3.1 mg/kg	
Pyrene		8.2 mg/L	8.2 mg/kg	

TABLE I-18

PCB SPILL CLEANUP STANDARD FOR SOIL IN 40 CFR 761.125

Contaminants of Concern	Affected Media	Standards	Citation
PCBs	Soil	PCBs at concentrations greater than 50 ppm are subject to decontamination TSCA requirements in 40 CFR 761.120(b).	40 CFR 761.125 Requirements for PCB Spill Cleanup
PCBs	Soil	All concentrated soils, solvents, rags, and other material resulting from a cleanup of PCB must be disposed of in accordance with provisions in 40 CFR 761.60.	
PCBs	Soil and Debris	PCBs resulting from the cleanup of spills, leaks, or other uncontrolled discharges at concentrations of 50 ppm or greater must be disposed of in an incinerator which complies with 40 CFR 761.70.	
PCBs	Soil and Debris	PCB containers containing non-liquid PCBs, such as contaminated soil, rags, and debris designated for disposal may be stored temporarily (up to 30 days from the date of removal) in an area that does not comply with the storage building requirements at 40 CFR 761.65 (b).	40 CFR 761.65 Disposal Requirements

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APPENDIX G

OPERABLE UNIT 1
NEPA IMPACT ANALYSIS

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LIST OF ACRONYMS

[illegible]FA	American Indian Religions Freedom Act
[illegible]	Applicable Relevant and Appropriate Requirements
AWWT	Advanced Waste Water Treatment (Facility)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CI	Confidence Interval
[illegible]E	U.S. Army Corp of Engineers
CRARE	Comprehensive Response Action Risk Evaluation
CRP	Chlorosulfanated Reinforced Polyethylene
DAC	Derived Air Concentration
DCG	Derived Concentration Guideline
DDT	Dichloro Diphenyl Trichloroethane
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
EA	Environmental Assessment
EDE	Effective Dose Equivalent
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPDM	ethylene-propylene-diene monomer
EWMF	Engineered Waste Management Facility
FEMP	Fernald Environmental Management Project
FONSI	Finding of No Significant Impact
FS	Feasibility Study
FS/PP-EA	Feasibility Study/Proposed Plan-Environmental Assessment
FS/PP-EIS	Feasibility Study/Proposed Plan-Environmental Impact Statement
ft	feet
ft^3	cubic feet
g	gram
gpm	gallons per minute

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LIST OF ACRONYMS
(Continued)

HEAST	Health Effects Assessment Summary Tables
HEPA	High Efficiency Particulate Air
HI	Hazard Index
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
ISCLT	Industrial Source Complex Long Term Model
kg	kilogram
km	kilometer
Kow	octanol/water coefficient
L	liter
lbs	pounds
LLW	low-level waste
LRA	Leading Remedial Alternative
μg	microgram
m	meter
m^3	cubic meters
mg	milligram
mi	mile
mrad	millirad
mrem	millirem
MTF	Memorandum to File
MUSLE	Modified Universal Soil Loss Equation
NAAQS	National Ambient Air Quality Standards
NCRP	National Council on Radiation Protection and Measurements
NAGPRA	Native Americans Grave Protection and Repatriation Act
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NOEL	no observed effect level
NOI	Notice of Intent

LIST OF ACRONYMS
(Continued)

NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTS	Nevada Test Site
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OHPO	Ohio Historic Preservation Office
PBRA	Preliminary Baseline Risk Assessment
ppb	parts per billion
PCB	polychlorinated biphenyl
pCi	picoCuries
PP	Proposed Plan
PRG	Preliminary Remediation Goal
RAD	Radiation Absorbed Dose
RCRA	Resource Conservation Recovery Act
R_fD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	reasonable maximum exposure
ROD	Record of Decision
s	second
SOWC	Southwestern Ohio Water Company
SWCR	Site-Wide Characterization Report
SWOAPCA	Southwestern Ohio Air Pollution Control Agency
U	uranium
UF_4	Uranium Tetrafluoride (green salt)
UO_3	Uranium Oxide (orange oxide)
USLE	Universal Soil Loss Equation
WEMCO	Westinghouse Environmental Management Corporation
yd^3	cubic yards
yr	year

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G.1.0 INTRODUCTION

G.1.1 PURPOSE

This appendix provides an assessment of the cumulative impacts that would result from implementation of the Operable Unit 1 preferred alternative with the leading remedial alternatives (LRAs), or preferred alternatives for each of the remaining four operable units at the Fernald Environmental Management Project (FEMP) site.

The LRAs for Operable Units 1 through 5 were developed in the Site-Wide Characterization Report (DOE 1993b) and are considered "LRAs" until they are analyzed in a FS document. For the purpose of a FS evaluation, the term remedial alternative is utilized. Remedial alternatives are analyzed in the FS document based on preliminary information. The "preferred alternative" is put forth in the Proposed Plan based on detailed information contained in the FS.

This assessment provides the most current information about how the potential impacts from Operable Units 2, 3, 4, and 5 relate to the potential impacts of Operable Unit 1. This appendix is an update of the cumulative impact analysis provided in the Operable Unit 4 Feasibility Study/Proposed Plan-Environmental Impact Statement (FS/PP-EIS). The description of the Operable Unit 1 remedial action has been updated for this appendix. In addition, efforts have been made to further quantify impacts in the cumulative impact analysis. Furthermore, several sections have been deleted from this version (e.g., site-wide no-action impact analysis appendices) to avoid duplication.

It is important to note that this cumulative assessment is based on currently available information and the currently assumed LRAs consistent with the Implementation Plan for the National Environmental Policy Act (NEPA) process at the FEMP site (DOE 1993a). Additional data will be collected and analyzed for Operable Units 2, 3, and 5 as these operable units progress through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. As additional information becomes available and/or the LRAs for Operable Units 2, 3,

and 5 change, revised NEPA appendices will be presented in the Feasibility Study/Proposed Plan-Environmental Assessment (FS/PP-EA) for Operable Units 2, 3, and 5.

G.1.2 SCOPE OF NEPA CUMULATIVE IMPACT ANALYSIS

The detailed evaluation in this cumulative impact analysis has been limited to impacts on and immediately adjacent to the FEMP site. Land use in the region around the FEMP site is rural and predominantly agricultural; however, there are specific areas around the FEMP site that warrant discussion due to other uses. Nevertheless, activities being carried out in the region around the FEMP site are generally not of the nature that they will have a cumulative impact on air quality, groundwater, biotic resources, etc., when combined with the FEMP site remedial activities.

Sites that warrant discussion include: (1) a CERCLA site immediately south of the FEMP site (approximately one mile) that is undergoing the Remedial Investigation/Feasibility Study process for an organic contamination plume in the Great Miami Aquifer (note that two other sites in the general area are being evaluated as potential CERCLA sites, but their proximity to the FEMP site does not justify or warrant a discussion); (2) a small quarry located less than a mile from the eastern boundary of the FEMP site; and (3) the potential for disposal of waste at an off-site location. The remaining areas near the FEMP site are primarily used for agricultural (i.e., cultivated fields) and limited residential domains.

The response action to address the contamination in the Great Miami Aquifer will likely involve pumping and some form of treatment. Furthermore, it will be relatively small scale when compared to the groundwater remediation associated with Operable Unit 5 at the FEMP site. Because the main activity will involve the pumping and treatment of groundwater, there will be minimal activity involving air emissions, excavation, disruption of habitat, etc., Therefore, cumulative impacts resulting from these activities in conjunction with the remedial activities at the FEMP site will be limited to the potential for impacts to groundwater and surface water (assuming treated water is discharged to the Great Miami River). The remedial alternatives for

Operable Unit 5 will need to take into consideration the remedial action taking place at the site south of the FEMP site.

Activities at the quarry involve some excavation and movement of soil and rock. Because the quarry is in the prevailing wind direction from the FEMP site, there is the potential that fugitive dust emissions from the FEMP site could combine with dust emissions from this quarry, resulting in increased levels of particulates to downwind receptors. However, the operation of the quarry is on a relatively small scale when compared to the overall remediation of the FEMP site. In addition, the amount of time soil will stay airborne is limited, and cultivated fields are the predominant land use downwind of both the quarry site and the FEMP site. Therefore, the cumulative impacts associated with these areas are expected to be minimal.

The disposal of waste at an off-site location is another activity that could result in cumulative environmental impacts. The preferred alternative for Operable Unit 1 involves the disposal of waste at a commercial permitted disposal facility. Waste that does not meet acceptance criteria at the commercial facility, not to exceed 10 percent of the total waste volume, will be shipped to the Nevada Test Site (NTS). In addition, the LRAs for the remaining operable units will likely involve the disposal of waste at off-site disposal facilities. Waste disposal facilities like the NTS dispose of large volumes of waste from various generating sources (other than the FEMP). Furthermore, the disposal of waste generated from the FEMP Operable Unit 4 and Operable Unit 1 response actions are not expected to significantly increase the volume of waste disposed of at the representative permitted commercial disposal facility and NTS or any other waste disposal facility. Impacts of waste disposal waste for the remaining operable units will be further evaluated in future versions of the cumulative impact analysis. Waste generated from the remaining operable units are not expected to cause exceedance of waste volume capacity at off-site waste disposal facilities.

The only potential for cumulative impacts associated with the FEMP response actions and the cultivated fields adjacent to the site would be the potential for increases in fugitive dust associated with excavation and transportation of wastes from the site. These cumulative impacts to air

quality in the area around the site will be minimal due to: (1) the limited amount of time that dust generated at the site and in the fields will stay suspended; and (2) the limited amount of receptors downwind.

Due to the land uses around the FEMP site, the potential for cumulative impacts to occur in the region around the site as a result of the implementation of the FEMP response actions is limited. Therefore, the focus of the detailed analysis in this appendix will be limited to the response actions for operable units carried out at the FEMP site as they pose the greatest potential for cumulative impacts to the environment and residents in the region around the site.

Efforts have been made throughout the NEPA Cumulative Impact Analysis to quantify impacts to the extent possible. For example, impacts to wetlands and habitats have been quantified (i.e., estimation of acres disturbed) wherever possible. In addition, the overall impacts of the FEMP remedial activities on the local socioeconomic structure has been quantified to the extent possible. Due to the timing of the remedial activities, quantitative information was not available in all cases. In these situations, a qualitative evaluation of potential impacts has been provided.

G.1.3 CERCLA/NEPA INTEGRATION APPROACH AT THE FEMP SITE

It is DOE policy to integrate NEPA into the CERCLA process wherever practical. DOE regulations concerning NEPA compliance are contained in Title 10 Code of Federal Regulations (CFR) Part 1021. Furthermore, DOE Order 5400.4 addresses the integration of environmental compliance processes of CERCLA and NEPA. According to the order, integration is to be accomplished by conducting the NEPA and CERCLA environmental planning and review procedures concurrently. Integration is intended to: (1) avoid duplicate effort and the larger commitment of resources that would be needed to implement both NEPA and CERCLA separately; (2) avoid conflicts in analysis and the selection of a remedial alternative; and (3) minimize the risk of delaying remedial actions on procedural grounds. The primary instrument for DOE's CERCLA/NEPA integration is the RI/FS process, supplemented as needed to address NEPA values. The final product is to be a single integrated set of documents -- a Remedial

Investigation (RI) report and a combined FS/PP-EIS (or EA) that satisfies the requirements of CERCLA and addresses NEPA values.

The CERCLA/NEPA integration approach for the site published in the Notice of Intent (NOI) concluded that: (1) an RI/FS-EIS was the appropriate level of NEPA documentation for the lead operable unit (i.e., Operable Unit 4), and (2) CERCLA/NEPA integration is also to be provided in the remaining four operable unit FS/PP-NEPA reports. The FS/PP-EA for Operable Unit 1 contains a discussion of common issues and potential cumulative impacts, referencing the Operable Unit 4 FS/PP-EIS as a lead document. All subsequent operable unit reports such as this NEPA Cumulative Impact Analysis for the Operable Unit 1 FS/PP-EA will also reference the material presented in the Operable Unit 4 FS/PP-EIS. This evaluation will update available information, as appropriate, and contain adequate operable unit-specific data to support the complete NEPA impact analyses to be contained in each operable unit FS.

G.1.4 REPORT ORGANIZATION

The "Notice of Intent to Prepare a FS/PP-EIS for the First of Five Remedial Actions at the FEMP," (55 Federal Register 94, 20183-20188) (DOE 1990a) states that the purpose of the first operable unit FS/PP-EIS is to analyze issues common to all operable units, examine potential cumulative impacts, and serve as a reference document for subsequent operable unit reports.

The descriptions of proposed remedial alternatives for Operable Unit 1 are contained in the main text of this FS report. Environmental impact analyses of Operable Unit 1 alternatives are contained in the detailed analysis of alternatives in Section 4.0. The detailed information on which the impact analysis was based is located in the Operable Unit 4 FS/PP-EIS. The Site-Wide Characterization Report (SWCR) contains the baseline data required for analyses of potential impacts of site-wide remediation, including a baseline ecological risk assessment (which has been summarized in the Operable Unit 4 FS/PP-EIS). The Proposed Plan presents the preferred alternative and summarizes the impacts of implementing it (including ecological risks). Section G.2.0 contains a description of the LRA for each operable unit. The LRA descriptions are followed by the analysis of impacts on soil and geology, water quality and hydrology, biotic

resources, wetlands and floodplains, socioeconomics, and land use. Cumulative impacts of proposed on-property actions are described in Section G.3.0, which analyzes the potential impacts on the environment from concurrent implementation of remedial activities for the operable units and site-wide facilities.

Federal, state, and local agencies consulted during the compilation of data for the FS/PP-NEPA evaluation and the relationship of remediation at the FEMP site to the objectives of local, state, regional, and federal land use plans, policies, and controls are described in Section G.4.0. Irreversible and Irretrievable Commitments of Resources resulting from remedial activities at the FEMP site are discussed in Section G.5.0 and the relationship between short- and long-term productivity is examined in Section G.6.0. Section G.7.0 contains the list of contributors. Attachment G.II describes FEMP site removal actions which may be considered in the definition of no action for future FEMP site documents.

G.1.5 SITE-WIDE BASELINE ECOLOGICAL RISK ASSESSMENT

The purpose of the ecological risk assessment, which was completed as a companion to the preliminary site-wide baseline risk assessment in the SWCR, was to estimate the potential and future baseline risks of FEMP contaminants to ecological receptors. The Operable Unit 4 FS/PP-EIS summarizes the Site-Wide Baseline Ecological Risk Assessment.

The U.S. Environmental Protection Agency (EPA) and DOE have agreed in the Amended Consent Agreement (September 1991) that the Site-Wide Ecological Risk Assessment would be performed as part of the Operable Unit 5 RI. The Site-Wide Ecological Risk Assessment in the Operable Unit 5 RI will assess the possible risks from current concentrations of site contaminants to ecological receptors inhabiting on-site and off-site areas not presently targeted for remediation based on human health concerns. A summary of ecological risk issues specific to Operable Unit 1 is provided in Section 4.0 of the Operable Unit 1 FS/PP-EA.

G.2.0 LEADING REMEDIAL ALTERNATIVES AND ENVIRONMENTAL CONSEQUENCES

This section contains descriptions of each of the operable units at the FEMP site. The LRAs for Operable Units 2, 3, and 5 are then described, followed by discussions of their potential environmental impacts. The preferred alternative for Operable Unit 4 is also discussed. For Operable Unit 1, this section summarizes the description of the preferred remedial alternative and its environmental consequences, which are presented in detail in Section 4.0 of the FS/PP-EA evaluation. The No-Action Alternative for the site was evaluated in detail in the SWCR and the cumulative impact analysis (Appendix G) for the Operable Unit 4 FS/PP-EIS.

The FEMP site was divided into five operable units under the original 1990 Consent Agreement. However, the definitions of these operable units have been revised under the Amended Consent Agreement, and a Comprehensive Site-Wide Operable Unit has been added. The five operable units and their revised definitions are presented below:

- Operable Unit 1 - Waste Pits 1 through 6, the Clearwell, the Burn Pit, berms, liners, and associated contaminated soil within the operable unit boundary
- Operable Unit 2 - the Active and Inactive Flyash Piles, the South Field, the Lime Sludge Ponds, the Solid Waste Landfill, berms, liners, and associated contaminated soil within the operable unit boundary
- Operable Unit 3 - the former Production Area and production associated facilities and equipment (includes all above- and below-grade improvements) including, but not limited to, all structures, equipment, utilities, drums, tanks, solid waste, waste, product, thorium, effluent lines, K-65 transfer line, waste water treatment facilities, fire training facilities, scrap metal piles, feedstocks, and the coal pile
- Operable Unit 4 - Silos 1, 2, 3, and 4, berms, the decant sump tank system, and associated contaminated berms and soil within the operable unit boundary
- Operable Unit 5 - perched and regional groundwater, surface water, soils not associated with other operable units, sediment, flora, and fauna

G.2.1 OPERABLE UNIT 1

Operable Unit 1 includes six low-level radioactive waste storage pits, the Burn Pit, and the Clearwell, all located west of the former Production Area (Figure G.2-1). The pits contain large quantities of liquid and solid wastes that were generated by the various operations at the FEMP site and disposed of before 1984. The Operable Unit 1 waste units are described in detail in Section 1.0 of the Operable Unit 1 RI Report. This discussion is summarized below and in Table G.2-1. A detailed description of the nature and extent of contamination associated with Operable Unit 1 is provided in Section 4.0 of the RI Report for Operable Unit 1. Summary data tables are also provided in Appendix A to this FS Report. Briefly, the waste pits in Operable Unit 1 contain the following:

- Waste Pit 1 - constructed in 1952 into existing native clay and then lined with an additional 1.2 meter (4 feet) of clay. The pit has a maximum depth of 8.9 meters (29.5 feet). Contents of the waste pit includes 48,500 cubic yards of waste and 19,900 cubic yards of contaminated cap and soil liner. Waste Pit 1 has been out of service since 1959, when it was backfilled, covered with clean soil, and graded to provide surface drainage into the Clearwell.
- Waste Pit 2 - constructed in 1957 and lined with native clay with a 4.2-meters (13.8-feet) average design depth and a maximum depth of 7.1 meters (23.5 feet). Contents of the waste pit includes 24,200 cubic yards of waste and 13,200 cubic yards of contaminated cap and liner soil. Waste Pit 2 has been out of service since 1964, when it was backfilled and covered with clean soil.
- Waste Pit 3 - constructed in 1958 by excavating into underlying glacial till and then adding a clay liner along the pit walls and bottom. The pit has a maximum depth of 12.8 meters (42.0 feet). The contents of the waste includes 204,100 cubic yards of waste and 103,400 cubic yards of contaminated cap and liner soil. Waste Pit 3 has been out of service since 1977, when it was backfilled and covered with clean soil.
- Waste Pit 4 - clay-lined pit constructed in 1960 with a 9.7 meters (32 feet) maximum depth. In 1984, an interim cap providing an additional cover of compacted clay overlain by a 45-mil-thick Hypalon chlorosulfanated reinforced polyethylene (CRP) liner was installed to further ensure segregation of encapsulated materials from surface water during the interim period prior to implementation of a final remedial action. Contents of the waste pit includes 55,100 cubic yards of waste and 17,700 cubic yards of contaminated cap and liner soils. In 1986, it was backfilled and covered with clean soil.

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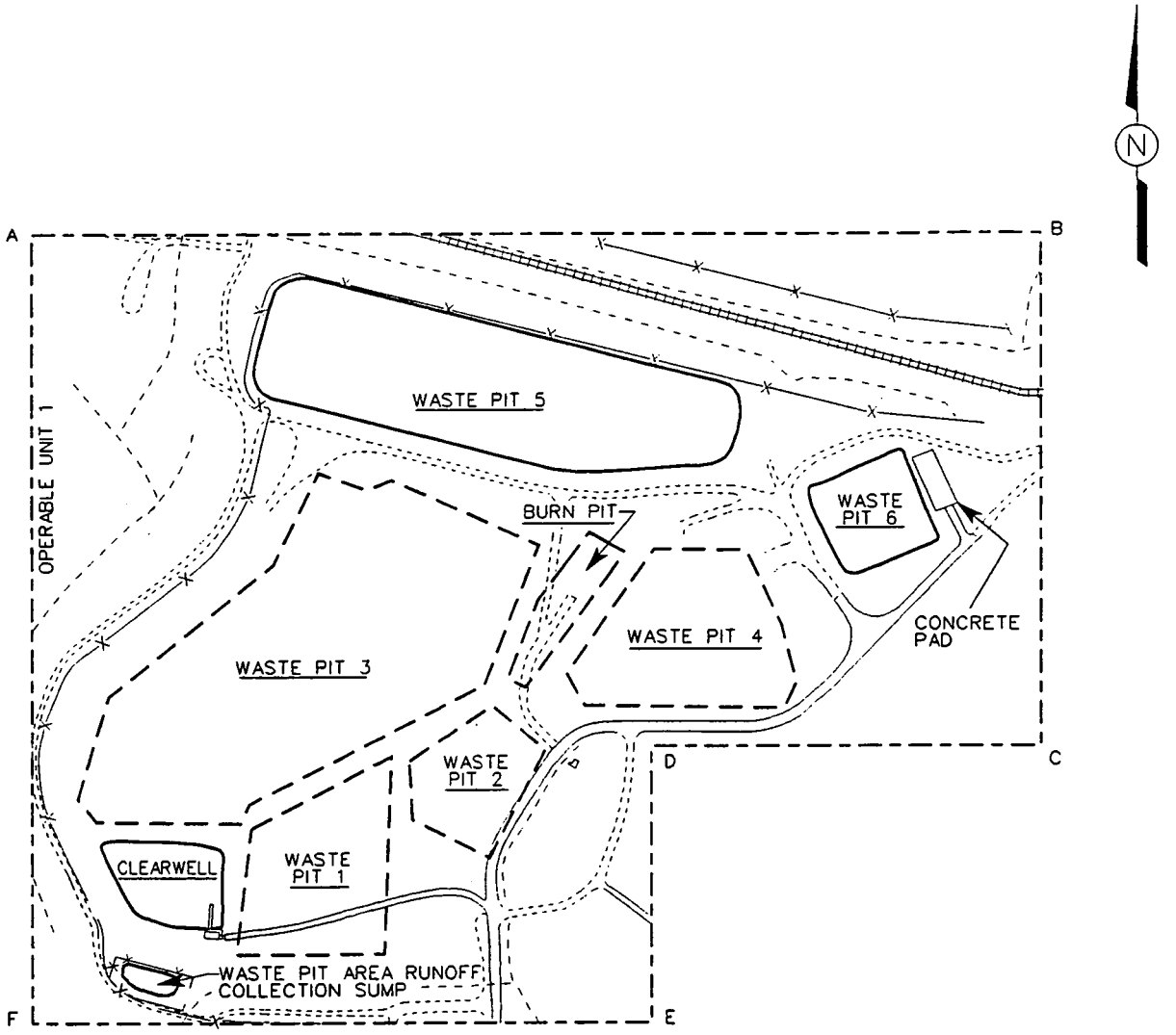

NOTES:

1. PITS 1, 2, 3 AND THE BURN PIT ARE COVERED WITH SOIL CAPS AND VEGETATED.
2. PIT 4 HAS AN INTERIM CAP.
3. PITS 5, 6 AND CLEARWELL ARE WATER COVERED
4. COORDINATES SHOWN ARE OHIO STATE PLANAR COORDINATES, ADJUSTED PER THE NORTH AMERICAN DATUM (NAD) OF 1983.

OU1 STATE PLANAR COORDINATES		
POINT	NORTHING	EASTING
A	482364	1377824
B	482364	1379432
C	481499	1379432
D	481499	1378812
E	481033	1378812
F	481033	1377824

LEGEND:

—X—X— FENCE LINE
DRAINAGE WAY
CSX RAIL LINE
PAVED ROADWAY
GRAVEL ROADWAY
OPERABLE UNIT 1 OUTLINE
COVERED PIT OUTLINE
OPEN PIT OUTLINE

SCALE: 0 300 FEET

409191-A-410 / OU1/ KNOX/ DS
409194 0.OU1 02-10-94 DON GOSS

FIGURE G.2-1. OPERABLE UNIT 1 SITE MAP

TABLE G.2-1

OPERABLE UNIT 1 WASTES[a]

Waste Pit	Surface Area (ft^2)(m^2)	Radioactive Waste (lbs)(kg)	Total Waste Volume (yd^3)(m^3)	Types of Waste
1	83,000/7,711	120,000/52,163 U	68,400/52,298	Filter cake, flyash, graphite, sump liquor, depleted slag, drums, uranium
2	45,000/4,181	2,700,000/1,224,699 U 880/399 Th	37,400/28,596	Filter cake, flyash, graphite, sump liquor depleted slag, drums, uranium, thorium
3	240,000/22,296	290,000/112,491 U 800/399 Th	307,500/235,114	Raffinate, raffinate concentrate, slag, filter cake, flyash, lime sludge, uranium, thorium
4	84,000/7,804	6,700,000/2,993,710 U 140,000/61,688 Th	72,800/55,662	Filter cake, slurries, graphite, raffinates, trash, asbestos, barium chloride, uranium, thorium
5	161,000/14,957	110,000/49,895 U 38,000/17,236 Th	97,900/74,854	Raffinates, slurries, lime sludges, uranium, thorium
6	32,400/3,010	1,900,000/861,826 U	9,600/7,340	Filter cake, slag, asbestos, uranium, process residues
Burn Pit	22,000/2,044	Unknown	30,300/23,167	Disposed lab chemicals, waste oils, uranium
Clearwell	25,500/2,369	Unknown	4,300/3,287	Process water settleable solids, uranium

[a] All stated quantities are approximate, and the information is based on process knowledge and production and disposal records.

SOURCE: Draft Final Operable Unit 1 Remedial Investigation Report, February 1994.

- Waste Pit 5 - constructed in 1968 and served as a settling pond for slurried waste from various production processes. It is a maximum 8.8-meters (29-feet) deep pond lined with a 60-mil-thick Royal-SEAL™ ethylene-propylene-diene monomer (EPDM) elastomeric membrane. When heavy rainfall occurs, storm water overflow from Pit 5 flows by gravity from the pit to the Clearwell. Contents of the waste pit include 97,900 cubic yards of waste covered with water. Waste Pit 5 has been out of service since 1983.
- Waste Pit 6 - constructed in 1979, this pit is a 7.3-meters (24-feet) deep pond lined with a 60-mil-thick Royal-Seal™ EPDM elastomeric membrane. The pit has been out of service since 1985 and has not been covered. The waste pit contains 9,600 cubic yards of waste, and standing water remains trapped within the berms of the pit. When heavy rainfall occurs, storm water overflow from Pit 6 flows to Pit 5 and then to the Clearwell.
- The Burn Pit - excavated in 1957 as a clay borrow pit for lining Waste Pits 1 and 2. The depth and size of the pit are not precisely known, but it is estimated to be approximately 9.1 meters (30 feet) deep. The pit was subsequently used for the disposal and burning of laboratory chemicals, waste oils, and other low-level radioactivity-contaminated materials such as wooden pallets. The pit contains 30,300 cubic yards of waste and soil mixed.
- The Clearwell - constructed in 1959 and served as a settling basin for process water and storm water runoff from the waste pits. The Clearwell contains 4,300 cubic yards of sludge and contaminated liner soils. Most recently, the Clearwell was used as a final settling basin for process water that passed through Waste Pit 5 prior to its discharge to the Great Miami River via the National Pollutant Discharge Elimination System (NPDES) permitted discharge. This use was terminated in March 1987 when Waste Pit 5 was removed from the process water treatment scheme. The Clearwell currently receives surface water runoff from the majority of the surfaces of Waste Pits 1, 2, and 3 and from the entire surface of Waste Pit 5. Water of varying depth remains in the Clearwell at all times. The sediment resulting from material deposition were removed on at least one occasion during the period of operation. The depth of sediment remaining in the Clearwell is estimated at 8.2 meters (27 feet).

G.2.1.1 Preferred Alternative for Operable Unit 1

The preferred alternative for Operable Unit 1 is identified as Alternative 5B, with off-site disposal considered with this alternative. There will be the removal and treatment of sufficient waste materials from and beneath Waste Pits 1 through 6, the Burn Pit and the Clearwell, to achieve risk-based action levels and Applicable or Relevant and Appropriate Requirements (ARARs). The excavated area will be backfilled with compacted soils.

Residual soils in the Operable Unit 1 area will be covered with a cap that has an infiltration limiting layer. The excavated materials will be treated (thermally dried) and transported by rail (only) to a permitted commercial disposal facility. Waste that does not meet acceptance criteria of the commercial disposal facility, not to exceed 10 percent of the total waste volume, will be shipped to NTS in 11.5-cubic meter (15-cubic yard) disposable containers. Treated waste disposed of at NTS would be transported first by rail and then transferred into trucks for transport to NTS. Remedial facilities will be decontaminated, dismantled and transferred to Operable Unit 3. This alternative also includes continued federal ownership of the FEMP to control future land use. The following actions also would occur:

- Removal and Treatment of Standing Water - Waste Pits 5 and 6 and the Clearwell have standing water requiring treatment by the AWWT facility. The effluent from this facility will be discharged to the Great Miami River and will meet all surface water preliminary remediation goals (PRGs) and ARARs and provisions of the site NPDES permit.
- Waste Removal and Segregation - Pit wastes and soils will be mechanically or hydraulically removed to risk-based, ARARs-based action levels. Waste segregation technologies will be employed to facilitate waste handling, treatment, packaging, and disposal.
- Waste Treatment - Excavated waste materials will be processed prior to treatment. Stable waste materials will be crushed, shredded, and sent directly for disposal. Pit waste will be dried and transported. Contaminated soil will be removed below the pit liners, and forwarded to Operable Unit 5 for management. Pit waste, caps, and liners will be excavated and transported to a controlled stockpile where the waste streams can be blended and directed into a shredder which feeds the dryers. The dried waste will be transferred to an operational storage silo above the rail siding. The rail siding will load the rail cars which will transport the treated waste to a commercial disposal facility. Treated waste disposed of at NTS would be transported first by rail, then transferred into trucks for transport to NTS. Surface soil throughout the entire affected area of Operable Unit 1 will be removed, contained, and turned over to Operable Unit 5 for management. Clean soil will be used as backfill to reestablish grades and promote proper runoff and drainage control. A cover system consisting of a vegetative layer, a drainage layer, and a dried composite infiltration barrier (synthetic and natural materials) would complete the seal of the Waste Pit Area.
- Capping - The Waste Pit Area will be backfilled with compacted soils and graded prior to installation of a multimedia cap. The floodplain will be regraded to the original elevation. Any displacement of bank material in Paddys Run would be restructured and returned to its original slope.
- Runoff/Run-on Control - Runoff control features would remove storm water from the operable unit area, and run-on control features would direct storm water away from the closed facility. Control can be accomplished by using

site contour grading, vegetation, diversion and collection ditches, as well as various physical devices, including silt traps and sedimentation basins.

G.2.1.2 Environmental Consequences for Operable Unit 1 Remediation

Potential impacts on air quality, groundwater, surface water, soils, terrestrial and aquatic ecology, threatened and endangered species, and social systems from implementation of the preferred alternative for Operable Unit 1 are discussed in this section.

G.2.1.2.1 Soil and Geology

Soil disturbances during implementation of the preferred remedial alternative for Operable Unit 1 would result from removing contaminated waste materials and soil from in and around each waste pit, the Clearwell, and the Burn Pit. Soil disturbances would also result from the construction of roads, the construction and operation of support facilities, and the operation of heavy equipment along waste pit berms. Surface soils exceeding action levels would be removed. The excavated surface soil will be transported to Operable Unit 5 for management.

The construction of support facilities would require the excavation of 6 hectares (15 acres) directly east of Waste Pit 2 and south of Waste Pit 4. The borrow area would require the excavation of 2.83 hectares (7 acres) of soil. Once remedial activities have ended, support facilities would be completely dismantled and materials would be managed of appropriately. The borrow area would be regraded and revegetated.

Short-term impacts to the soil and geology would result from excavation and construction activities. This would result in increased erosion of exposed areas and the generation of fugitive dust. Engineering controls (e.g., silt fences and revegetation) would be used as appropriate to minimize impacts to soil. As construction activities are completed, disturbed areas would be filled with borrow soils and revegetated with native vegetation. Soil below the pit liners would be removed to satisfy action levels for Operable Unit 1 and transported to Operable Unit 5 for management. Caps would placed over the excavated waste pits.

The long-term impacts on soil would be minimal on the FEMP site. Areas totaling approximately 15 hectares (37 acres) would be disturbed during remedial activities; however, through the use of backfill soils, attempts would be made to return these areas to their previous condition once remedial activities are completed. When waste materials from each

pit have been removed for treatment, contaminated soil would be removed below the liner material and transferred to Operable Unit 5 for management. Surface soil would be removed over the affected area of Operable Unit 1. The southeast drainage ditch diverts storm water away from the Waste Storage Area and collects in the Storm Water Retention Basin, preventing contaminated materials from entering Paddys Run. Efforts would be made not to breach the glacial overburden and allow contaminated materials to enter the Great Miami Aquifer. All excavated areas would be returned to near original contours through the use of backfill soils. These soils would be obtained from a 2.8 hectares (7 acre) borrow area directly north of Operable Unit 1, and an off-site commercial source.

In the short term, soil disturbance at NTS would involve 1.2 hectares (3 acres) for the excavation of the disposal facility and the use of borrow soils for capping activities. Disturbances may also result from the development of berms and heavy equipment traffic. Standard engineering controls would be implemented to prevent the release of fugitive dust or sedimentation build-up as a result of erosion.

In the long term, areas at NTS would be permanently disturbed for the disposal of treated materials. Borrow material from NTS may be required for the shallow land disposal burials there. The geology of NTS has been determined to be suitable for disposal of Low Level Radioactive Waste (LLRW) (DOE 1991). NTS is characterized by great depths to the groundwater table. Depths to groundwater beneath NTS vary from about 157 meters (515 feet) to more than 600 meters (2,000 feet) (DOE 1991). Groundwater movement in the saturated and unsaturated zones is very slow and there is an extremely low potential for radioactivity transport to off-site areas. In addition, downward movement of the groundwater is exceedingly slow in the unsaturated zone; that also serves as a significant barrier to radioactivity transport. These parameters make the geology of NTS very suitable for long-term disposal activities.

Approximately 0.81 hectares (2 acres) of soil would be disturbed at the representative permitted commercial disposal facility as a result of off-site waste disposal. Disturbances in the area would result from borrow materials needed for capping activities, the development of berms, roads, and support facilities. Engineering controls would be implemented to prevent the release of fugitive dust or sedimentation buildup as a result of erosion.

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Soil at the representative permitted commercial disposal facility would be permanently disturbed for the disposal of treated materials. Borrow material from the permitted commercial disposal facility may be required for the shallow land disposal burials at the facility. Depths to the groundwater beneath the commercial disposal facility vary from 6 to 9 meters (20 to 30 feet) below the ground surface. The hydraulic head gradient in the groundwater is small, limiting the velocity of groundwater movement away from the groundwater flowing away from the site to a maximum of .08 meters (.6 feet) per year (DOE 1984). The design of the disposal cell and the high evapotranspiration rate characterized in the area would also reduce the potential for contaminant transport. Several layers of unsaturated silty sand with medium to high densities indicate that the geology of the representative commercial disposal facility is suitable for the disposal of waste from Operable Unit 1.

G.2.1.2.2 Water Quality and Hydrology

Excavation, dredging, trenching, and construction activities could result in short-term impacts to water quality at the Fernald site. Increased erosion of exposed areas and fugitive dust could increase sediment loads to local drainage areas, which in turn would increase turbidity in Paddys Run and possibly off-site surface waters. The construction of an engineered outfall into Paddys Run would result in short-term impacts to water quality and minor alterations to the east bank of Paddys Run. Short-term impacts to water quality would occur from sediment deposition into Paddys Run.

Engineering controls would be used during construction activities to minimize erosion and the transport of sediment off site. Specific controls include the use of berms, silt fences, straw, geotextile membranes, revegetation, and water collection systems.

Surface water from excavated areas and support facilities that have come in contact with contaminated areas would be collected and treated appropriately. Through the use of the Waste Pit Area Collection System and AWWT facility, runoff during remedial activities will be collected and treated to meet the parameters of the Fernald site's NPDES permit.

Spills or releases associated with Operable Unit 1 remedial activities would be addressed according to response actions. Any wastewater generated during the removal or treatment of waste material or soil would be treated before discharge from the site.

Surface water at the Fernald site would be monitored in accordance with existing permits and regulatory requirements during the action period. A change in the level of constituents detected would result in appropriate action to control further contaminant migration.

Dewatering activities would prevent the leaching of contaminated materials into the Great Miami Aquifer. The remediation of groundwater at the Fernald site is being addressed by Operable Unit 5. The existing groundwater monitoring program would be maintained during the remediation process. Any changes in groundwater contamination would be detected and appropriate response actions would be taken.

After the sources of contamination associated with Operable Unit 1 are removed, surface water and groundwater would be protected through monitoring and maintenance activities. Assuming monitoring and maintenance activities continue at the Fernald site, no long-term impacts to water quality and hydrology are anticipated once the remedial activities have been completed.

Once remedial activities associated with Operable Unit 1 have been completed and contamination sources have been removed, the area would be regraded and contoured to promote proper runoff and drainage. Surface water runoff would be routed to the appropriate collection/treatment system or to drainage ditches leading off site; therefore, no long-term impacts to water quality and hydrology at the Fernald site are anticipated.

The disposal of treated material at NTS would not be expected to have significant long-term impacts on water quality or hydrology. Groundwater at NTS would not be impacted in the short term by disposal of dried waste and soil from Operable Unit 1. There are no continuously flowing streams on NTS property. Stream beds carry water only during unusually intense or persistent rains. Rainfall, averaging 15 centimeters (6 inches) per year, infiltrates quickly into moisture-deficient soil. These parameters, coupled with suitable geology, would help minimize long-term impacts to water quality. Engineering controls (e.g., capping) and ongoing monitoring activities would also be used to control and minimize water quality impacts.

Long-term impacts to water quality and hydrology at the representative permitted commercial disposal facility would be minor. No surface water exists within 37 kilometers (23 miles) of

the facility; thus, no impacts to surface water are expected. Several layers of silty sand combined with the high evapotranspiration rate in the area would protect groundwater, making the location very suitable for the disposal of waste. No short-term impacts to water quality or hydrology would result.

G.2.1.2.3 Air Quality

The remedial activities proposed for Operable Unit 1 involve several activities that could impact air quality at the Fernald site. Short-term impacts associated with the removal and transport of waste materials, the construction and operation of support facilities, the operation of heavy equipment, and the operation of process facilities could periodically impact air quality. Through a combination of engineering design and engineering controls, impacts to air quality would be minimized.

The greatest air quality impacts would be an increase in particulate due to excavation, dredging, and trenching activities. Proper engineering practices (e.g., wetting, tarping, and revegetating) would be used to minimize particulate increases from fugitive dust. Ongoing monitoring activities would be used to detect increases in particulate and other airborne pollutants. Gaseous emissions from the shredding and drying processes would pass through a combination quencher/scrubber equipped with HEPA filters to remove regulated pollutants and particulate before being discharged to the atmosphere.

Materials removed from Operable Unit 1 and disposed of at NTS are not expected to change existing conditions at NTS in the long term. Disposal of treated material would not result in major short-term air quality impacts. Minor increases in fugitive dust due to equipment operation and excavation moving activating may be experienced.

The shipment of dried waste to the representative commercial disposal facility in Clive, Utah, would result in minor increases in emissions related to exhaust from locomotives during transportation and heavy equipment operation at the disposal facility. However, due to the number of shipments, short-term impacts to the air would be negligible. Air monitoring activities would be implemented throughout the disposal facilities.

The long-term impacts on the air quality at the Fernald site would be minor because airborne releases associated with the waste pits would be removed. All areas disturbed for remedial

activates (i.e., heavy equipment operation, construction and operation of support facilities, capping, and regrading activities) would be protected through the proper mitigative measures. Materials removed from Operable Unit 1 and disposed of at the representative commercial disposal facility in Clive, Utah are not expected to change existing conditions.

G.2.1.2.4 Biotic Resources

FEMP

The short-term disturbance of on-property vegetation and wildlife habitat would result from activities associated with: (1) excavation of pit waste and residual soil, (2) the borrow pit area, and (3) construction of support facilities.

Operation of the shredding and drying facilities would have minor impacts to wildlife from increased deposition of airborne contaminants. Prevailing winds may deposit particulate from the shredding and drying facilities onto the northern mid-successional woodlot and northern pine plantation, increasing wildlife exposure. HEPA filtration would be used to capture particulates.

No critical habitat for threatened and endangered species has been identified in areas to be impacted by Operable Unit 1 activities. However, there is potential for threatened and endangered species to reside near the Waste Pit Area, which could be impacted by this alternative.

The Indiana bat *(Myotis sodalis)* is a federally endangered species whose range extends into the vicinity of the Fernald site along Paddys Run. No individuals of this species were located at the Fernald site; however, suitable habitat exists within the banks of Paddys Run.

The Sloan's crayfish *(Orconectes sloanii)* is a state threatened species which resides in Paddys Run at the Fernald site. No long-term impacts are expected as a result of implementing the mitigative measures.

Running buffalo clover *(Trifolium stoloniferum)* is a federally endangered plant species that has been recorded within the Miami Whitewater Forest, approximately 8 kilometers (5 miles) southwest of the Fernald site. The potential exists for this species to be present within the riparian area between Paddys Run and Waste Storage Area, as well as the proposed location

of the borrow pit. Slender fingergrass *(Digitaria filiformis)* and mountain bindweed *(Polygonum cilinode)* are state endangered plants that may be present near the Waste Storage Area at the Fernald site. Spring coralroot *(Corallorhiza wisteriana)* is a state threatened orchid that is found in forested wetlands and wooded ravines. Spring coralroot has not been recorded at the Fernald site, but ODNR has reported a population within Miami Whitewater Forest. The loss of the riparian habitat which supports a wide variety of flora and fauna, in addition to the threatened and endangered species previously mentioned, would be restored after completion of remedial activities. No long-term impacts are expected as a result of implementing mitigative measures.

Excavation activities would result in the loss of approximately 5.37 hectares (13.2 acres) of riparian habitat, containing diverse flora and fauna, in addition to the above-mentioned threatened and endangered species. No long-term impacts are expected as a result of implementing mitigative measures.

Impacts to biotic resources from Operable Unit 1 activities would be offset by implementing the following mitigative measures: potential habitat for the Indiana bat *(Myotis sodalis)* and individuals associated with this potential habitat would be lost as a result of excavation, regrading, and revegetation activities. To mitigate this impacts, bat boxes and/or tree snags would be installed upstream of the Waste Storage Area along Paddys Run. These boxes and/or snags would be placed within mature riparian habitat, near pooled sections of Paddys Run.

Potential habitat for running buffalo clover *(Trifolium Stoloniferum)* would be lost as a result of excavation, regrading, and revegetation activities. To mitigate this impact, this species would be relocated off site to a known running buffalo clover habitat. Miami Whitewater Forest, a county park approximately 3.2 kilometers southwest of the Fernald site would be used for relocation since it presently supports a population of running buffalo clover. A detailed species relocation plan would be produced to implement this type of mitigation. This plan would include site preparation requirements, relocation procedures, and relocation success monitoring. If this plant species is found within a controlled area, no relocation would be attempted. Mitigation of species within a controlled area would be coordinated with appropriate regulatory agencies. Reestablishment of suitable habitat for running buffalo clover may occur on-site as a result of the riparian habitat restoration effort.

Slender fingergrass *(Digitaria filiformis)* and mountain bindweed *(Polygonum cilinode)* would be impacted as a result of excavation, regrading, and revegetation activities. If found, these plant species would be relocated to suitable habitat elsewhere in the state of Ohio. Reestablishment of suitable habitat may occur from restoring the riparian area.

Spring coralroot *(Corallorhiza wisteriana)* has potential habitat within the riparian area that would be impacted by excavation activities. Mitigative measures would be the same as other plant species.

Sloan's crayfish *(Orconectes sloanii)* populations are supported by Paddys Run. Regrading activities would impact these populations. Regrading and excavation activities would have short-term impacts to the populations as a result of sediment deposition. Increased sediment load as a result of remedial activities would impact Sloan's crayfish habitat and individuals. Mitigation of these impacts include runoff control measures (silt fences and straw bales), which would be implemented to minimize sediment deposition. The natural flow of Paddys Run would re-establish a natural stream community, naturally mitigating any impacts to the Sloan's crayfish from sediment load.

Excavation and regrading activities would impact 5.37 hectares (13.2 acres) of riparian habitat. This habitat would be restored by planting riparian hardwood tree species, such a sycamores and cottonwoods, upon completion of remedial activities. Shrub species may also be planted to assist in the secondary successional process. Wildlife boxes would also be installed to re-establish mammal and bird populations.

Approximately 0.81 hectares (2 acres) of the existing plant community (shadscale-gray molly) and its attendant habitat for wildlife residents at the commercial disposal facility would be disturbed. This type of plant community is neither unique nor particularly valuable. The flora or fauna in the potentially disturbed area are neither endangered or threatened. The displacement of individuals during construction activities is expected to be minor. Moreover, native plants would be reestablished after disposal activities have ended.

Off-Site Disposal Facility

Most of the NTS is vegetated by various desert shrubs. There are 711 types of vascular plants within or near the boundaries of NTS (DOE 1991). Several mammal species on NTS

(e.g., feral horses, burros, mountain lions, kit foxes) have been placed on the protected classification list by the State of Nevada. The desert tortoise (*Gopherus agassizii*) is federally listed as a threatened species and is present in some areas of NTS. Disposal activities at NTS related to the Operable Unit 1 remedial activities are not expected to impact the habitat of the dessert tortoise or displace any other species at NTS.

G.2.1.2.5 Wetlands and Floodplains

A wetlands delineation for the Fernald site was conducted in December 1992 (Ebasco Environmental 1993) and approved by U.S. Army Corps of Engineers (COE). The delineation identified approximately 0.72 hectares (1.77 acres) of isolated scrub-shrub/persistent emergent wetlands west of the waste pits and 0.08 hectares (0.21 acres) of drainage ditch/swale wetlands south of the waste pits to be impacted from remedial activities. Approximately 1.09 hectares (2.7 acres) of drainage ditch/swale wetlands would be lost due to the borrow area.

There are approximately 1.89 hectares (4.67 acres) of wetlands which would be impacted from remedial activities. Engineering controls implemented during site activities, such as silt fences and straw bales, would minimize migration of eroded soil to adjacent wetland areas.

Remedial activities would have short-term impacts on the 100- and 500-year floodplain of Paddys Run due to regrading activities adjacent to the stream. However, permanent construction of a stone lined drainage ditch and engineered outfall in the floodplain would not after flow patterns or uses of the floodplain since they would be below original elevations. This would result in an increase of the floodplain area adjacent to Paddys Run, thus decreasing flood elevations downstream during the 100- to 500-year flood event. Disturbed areas of the floodplain would be regraded to near original contours. A floodplain/wetlands assessment was prepared in accordance with 10 CFR 1022 and is presented in Appendix H. No floodplains or wetland areas exist within the representative permitted commercial disposal facility or NTS boundaries.

G.2.1.2.6 Socioeconomics and Land Use

Minor socioeconomic impacts would be expected from implementing remedial activities. To better assess short-term economic impacts, it is assumed that all resources needed for remedial activities, excluding treatment equipment, and disposal cost at the permitted disposal

facility, would be purchased within the Consolidated Metropolitan Statistical Area (CMSA). Rather than addressing each individual county and the resources they are capable of supplying, each county's public and private expenditures was combined yielding a total expenditure figure of $805,000,000 for fiscal year 1992 to 1993. Total estimated capital cost of implementing Alternative 5B would be $525,063,363 (total present worth of $404,903,000). Excluding the cost of the treatment equipment and disposal costs, public and private expenditures would increase by approximately 10 percent over a 5-year period. Consequently, minor economic impacts would result from the implementing Alternative 5B.

NTS encompasses about 3,500 square kilometers (1,350 square miles), an area larger than the State of Rhode Island. NTS primary land use is nuclear weapons testing (since 1951) and LLRW disposal for on-site and off-site DOE-affiliated generators. NTS is surrounded on the east, north, and west sides by public access exclusion areas (e.g., Nellis Air Force Base Bombing and Gunnery Range). This area provides a buffer zone between the test areas and public lands of 24 to 105 kilometers (15 to 65 miles). The population density within a 150 kilometers (93 miles) radius of NTS is about 2.8 persons/square kilometers (7.25 persons/square miles). In comparison, the 48 contiguous states (1990 census) had a population density of approximately 29 persons/square kilometers (75 persons/square miles). The off-site areas adjacent to NTS are predominantly rural; hence, aesthetic impacts would be expected to be minimal. Treated material disposal activities, associated with this alternative, would not impact to socioeconomics or land use at NTS.

The representative commercial permitted disposal facility is located in Tooele County, Utah. The county encompasses 700 square miles within the state and had a population in 1990 of 26,000, representing approximately 1.5 percent of the population of Utah. (The population of Utah was 1,723,000 in 1990). The population in Tooele County has increased, on the average, 3.2 percent between 1970 and 1980; however, it remained constant over the past ten years at approximately 26,000. Most lands within a 16 kilometers (10 miles) radius of the site are very rarely used because of their remoteness from urbanized areas and the poor spill, occasional muddy conditions, and sparse vegetation characteristic of the region. Sheep grazing and recreational-vehicle driving are the primary uses made of the area, but such uses are apparently light. Although no reports on land uses in the vicinity could be found, numerous trails in the area indicate that it has been used on occasion for recreational vehicle purposes, and much of the vicinity may be used on occasion for hunting. The only other use

of lands within a 16 kilometers (10 miles) radius is for transportation. Interstate 80 and the Union Pacific System railway pass 4 kilometers (2.5 miles) and 1.6 kilometers (1 mile) north, respectively, of the site.

Treated material disposal activities would not impact socioeconomics or land use at the representative commercial disposal facility.

Transportation. Minor increases in traffic flow on and around the Fernald site would result. Temporary increases in deliveries and workers to the Fernald site are not expected to result in any significant impact to traffic patterns or roadways. The implementation of Operable Unit 1 action would result in a minor increase to traffic flow and roadways.

Treated material would be transported first by rail, and then transferred into trucks for transport to NTS. Environmental impacts from shipping and disposing of treated material are expected to be minimal from normal transportation because all procedures would be in compliance with applicable DOT and DOE requirements. The risk to workers and to the public associated with the transportation of treated material is addressed in Appendix D to this FS Report.

Transport of treated material by rail to the representative permitted commercial disposal facility would have minimal environmental impacts, as all procedures would be in compliance with all applicable DOT and DOE requirements. The risk to workers and to the public also is addressed in Appendix D.

G.2.1.2.7 Cultural Resources

The representative commercial disposal facility has been used for grazing since the early settlers. No events of historical significance are known to have occurred on the site. The Donner Trail probably passed north of the site, but the trail's exact location is unknown. A cultural resource inventory for the facility was performed in August 1981 by the Archaeological Environmental Research Corporation (DOE 1984). No cultural resource sites were found. The Ground to Air Pilotless Aircraft Launch Site and Blockhouse are listed in the National Register of Historic Places and is approximately 16 kilometers (10 miles) west of the facility. The Isopia Settlement Cemetery site is located to the southeast of Clive, Utah

[approximately 37 kilometers (23 miles)]. These are the nearest historical sites to the disposal facility and are not expected to be impacted from the implementation of Alternative 5B.

A FEMP site-wide archaeological survey would be performed for the impacted areas associated with remedial activities for Operable Unit 1. Cultural resource areas would be managed consistently with the requirements of the National Historic Preservation Act, Ohio Historic Preservation Office, American Indian Religious Freedom Act, and the National American Grave Protection Repatriation Act. Because any cultural resources identified would be either avoided or managed appropriately, there would be no impacts to cultural resources at the Fernald site.

G.2.2 OPERABLE UNIT 2

Operable Unit 2 includes the following waste units: the Solid Waste Landfill; the Lime Sludge Ponds; an Inactive Flyash Pile; an Active Flyash Pile and the South Field, an area between and adjacent to the flyash areas. The contents of the waste units are described below, and volumes are provided in Table G.2-2. A detailed description of the nature and extent of contamination associated with Operable Unit 2 is provided in the Operable Unit 2 RI Report (DOE 1992) that is currently being revised.

- Solid Waste Landfill - located on a 1.2-hectares (3-acre) tract at the northeast corner of the Waste Storage Area and northwest of the former Production Area. It has been reported that the landfill consists of an original disposal area, an evaporation pond, and five disposal cells, although aerial photographs and trenching have not yet confirmed the presence or absence of these areas. The Solid Waste Landfill was used through early 1986 for the disposal of cafeteria wastes, rubbish, and other wastes from nonprocess areas. Materials that reportedly have been disposed of at the landfill include: nonburnable, nonradioactive solid wastes generated on site; nonradioactive, construction-related rubble; nonradioactive asbestos (double-bagged and bulk quantities); medical wastes; radioactively-contaminated construction rubble; and radioactively-contaminated soils used to cover exposed wastes.
- Lime Sludge Ponds - consist of two ponds, north and south. The North Lime Sludge Pond is an active, unlined pond located southeast of the Waste Storage Area with approximate dimensions of 38 meters by 69 meters by 1.6 meters (125 feet by 225 feet by 5.3 feet). This pond is approximately 90 percent full, with a freeboard depth of 0.6 meters (2 feet), and is partially covered with vegetation. Standing water that accumulates in the north pond is periodically pumped from the pond to the General Sump. Spent lime sludges (primarily lime-alum and boiler plant blowdown) from the FEMP site water treatment plant operations have been conveyed to this active pond.

TABLE G.2-2

OPERABLE UNIT 2 WASTES

Study Area	Surface Area (Feet^2)(m^2)	Waste Volume (yd^3)(m^3)	Types of Waste
Solid Waste Landfill	40,700/3,781	19,600/14,985	Cafeteria wastes, sanitary rubbish, asbestos, construction rubble, medical wastes
North Lime Sludge Pond	28,100/2,611	5,500/4,205	Spent lime sludge
South Lime Sludge Pond	28,100/2,611	11,700/8,945	Spent lime sludge
Active Flyash Pile	87,120/8,094	58,500/44,956	Flyash, waste oils, construction rubble, asphalt, masonry, steel, uranium
Inactive Flyash Pile	130,680/12,141	78,500/60,018	Flyash, waste oils, construction rubble, asphalt, masonry, steel, uranium
South Field	479,160/44,515	109,000/83,336	Construction rubble

SOURCE: Site-Wide Characterization Report, 1993.

Records do not indicate the routing of any hazardous chemicals or radioactive materials to this pond.

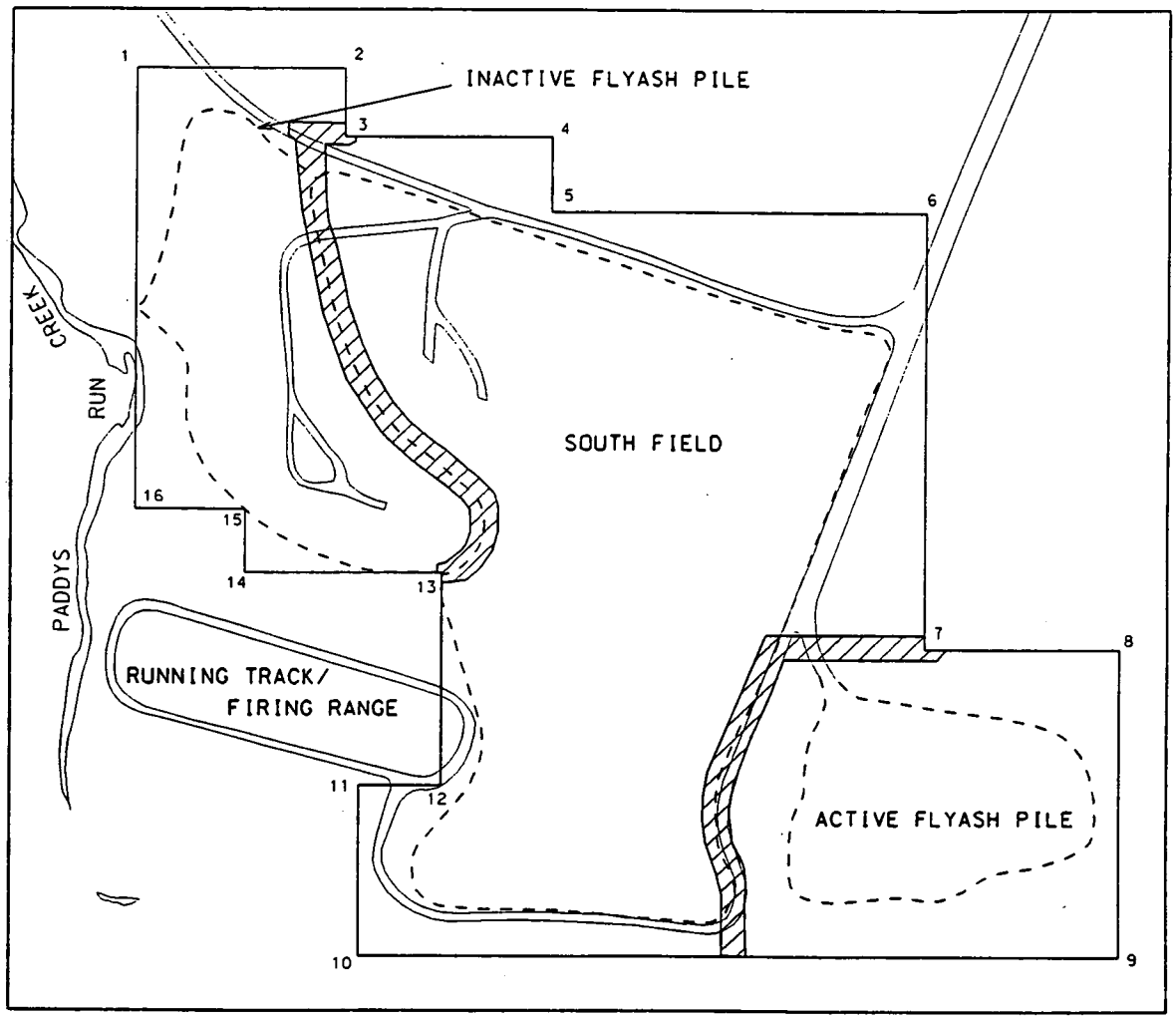
The South Lime Sludge Pond is an inactive, dry, unlined pond located directly south of the north pond. The approximate dimensions of the South Lime Sludge Pond are 38 meters by 69 meters by 3.4 meters (125 feet by 225 feet by 11.2 feet). This pond is retired and overgrown with vegetation. The use of this pond was similar to that of the North Lime Sludge Pond. Records again do not indicate the routing of any hazardous chemicals or radioactive materials to this pond.

- Active Flyash Pile - formerly received flyash from the coal-fired boiler plant at the FEMP site. This disposal area is located east of the running track and on the east side of the south construction road (Figure G.2-2). The Active Flyash Pile is a roughly hexagonal area of approximately 8094 square miles (87,120 square feet) with a maximum height of 12 meters (40 feet). The Storm Sewer Outfall Ditch runs along the southeast side of the area.
- Inactive Flyash Pile - located approximately 914 meters (3000 feet) south/southeast of the Waste Storage Area, northwest of the Active Flyash Pile, and west of the South Field. The Inactive Flyash Pile, which is no longer used, covers approximately 12,141 square meters (130,680 square feet) and is sparsely covered with soil and vegetation.
- South Field - located between the Inactive and Active Flyash Piles where construction rubble was dumped on the surface of the glacial overburden. The thickness of the fill increases at the western and southern edges of the area to approximately 6 meters (20 feet) because material was dumped down the natural slope of an old meander scar. A review of the shallow trenches through the fill indicates that the material is predominantly soil with some rock and concrete and only occasional pieces of wood. The construction rubble deposited in the South Field contained low levels of radioactive materials. Results of trenching activities indicate that the buried materials are within the top 1.2 meters (4 feet) of soil.

Data gathered in Operable Unit 2 indicate the areas hold large volumes of solid waste into which small volumes of radiological and/or chemical wastes may have been co-disposed. A review of the RI/FS sampling data for the Active and Inactive Flyash Piles and the South Field indicates concentrations of uranium-238 in all media (DOE 1992).

G.2.2.1 Leading Remedial Alternative for Operable Unit 2

The LRA for Operable Unit 2 is capping each of the waste units with a multimedia cap. The waste would be regraded and runoff/run-on controls also would be used. This alternative would prevent direct contact with the waste and surface transport of waste. This alternative



LEGEND:

- BOUNDARY BETWEEN FLYASH PILES AND SOUTH FIELD
- OPERABLE UNIT 2 STUDY AREA
- ROADWAY
- EXTENT OF FILL

SCALE: 0 — 300 FEET

STATE PLANAR COORDINATES

1.	N478348	E1378859
2.	N478348	E1379148
3.	N478225	E1379148
4.	N478225	E1379500
5.	N478091	E1379500
6.	N478091	E1379933
7.	N477509	E1379933
8.	N477509	E1380172
9.	N477064	E1380172
10.	N477064	E1379174
11.	N477295	E1379174
12.	N477295	E1379289
13.	N477617	E1379289
14.	N477617	E1379014
15.	N477715	E1379014
16.	N477715	E1378859

FIG_G.2-2 02-11-94 DON GOSS

FIGURE G.2-2 OPERABLE UNIT 2, FLYASH/SOUTH FIELD STUDY AREA

also includes continued government ownership of the land to control future land use. The drainage north of the Solid Waste Landfill, an emergent wetland area, will require realignment to implement this LRA. For the Lime Sludge Ponds, a shallow-soil mixing technology will be used before capping. South Field/Flyash Area, Paddys Run, and the Storm Sewer Outfall Ditch are identified as floodplains and will require realignment. The following processes will also occur:

- Capping - The closure cap will be designed and constructed using a low-permeability clay layer, a flexible membrane layer, a natural drainage layer, and a vegetative cover. All cap units will be contoured to grades that promote drainage while minimizing the effects of waste subsidence and storm water erosion. Shallow soil mixing employing cement and/or soils will be applied to the materials within the Lime Sludge Ponds to stabilize the waste material before placement of the capping system.
- Runoff/Run-on Control - Runoff control features remove storm water from the operable unit area and run-on control features direct storm water away from the closed facility. Control can be accomplished using site contour grading, vegetation, diversion, scales and ditches, as well as physical devices including weirs, baffles, and lined sedimentation basins.
- Biointrusion barrier - A biointrusion barrier may be added to the cap between the vegetative cover and the drainage layer. This barrier could consist of a 0.6-meters (2-feet) thick layer of cobbles and would be designed to preclude deep-rooting plants and burrowing animals from damaging the flexible membrane liner and low-permeability clay liner. A filter layer would be placed on top of the biointrusion barrier to limit soil migration into this layer.

G.2.2.2 Environmental Consequences for Operable Unit 2 Remediation

Potential impacts on air quality, groundwater, surface water, soils, terrestrial and aquatic ecology, threatened and endangered species, and social systems from implementation of the LRA for Operable Unit 2 are discussed in this section.

G.2.2.2.1 Soil and Geology

The shallow soil mixing in the Lime Sludge Ponds could result in spills that could have minor localized impacts on surface soils in the area. Soil contaminated by a spill could be cleaned up with the spill, thereby eliminating the potential for contaminant migration.

Long-term impacts on both surface and subsurface soils from Operable Unit 2 remedial actions should be beneficial. Once the units are capped, rainfall infiltration into the waste

units would be substantially reduced. This would reduce the amount of leachate formed in the units and reduce the migration of contaminants into the subsurface soils. Also, the wastes would be isolated from storm water runoff, preventing contaminant migration through runoff to adjacent surface soils.

G.2.2.2.2 Water Quality and Hydrology Groundwater

Because this alternative for Operable Unit 2 would leave the wastes in place, the short-term impacts on groundwater would be essentially the same as those of the no-action alternative. As capping of the units progressed, less rainfall would come in contact with the waste, less leachate would be formed within the Solid Waste Landfill and the Lime Sludge Ponds, and less contaminated storm water runoff would be formed at the South Field/Flyash Area. This would have beneficial short- and long-term effects on both perched and regional groundwater.

Surface Water. Short-term adverse impacts on Paddys Run could result from the release of contaminants into runoff during cap construction activities and from the rerouting of on-property drainageways. These impacts would likely be minor since best management practices would be in place to capture runoff and sediment migration. Short-term adverse impacts on Paddys Run could result if capping of the South Field and flyash piles requires the relocation of the stream. Impacts would be associated with increased turbidity and the disturbance of contaminated soils and sediment. Long-term impacts of capping would be beneficial because rainwater and runoff would be prevented from coming into contact with waste and transporting contaminants to Paddys Run. Impacts on Paddys Run sediment would be similar in magnitude to impacts on surface water. However, contamination of sediment at specific sites in Paddys Run is unlikely to be stable due to the highly variable flow regime in the stream and frequent flushing out of deposited material. Beneficial impacts on sediment would consist of preventing any long-term releases of Operable Unit 2 contaminants to Paddys Run.

The capping of the flyash piles and the South Field would not have an adverse impact on the Great Miami River during construction because runoff control measures would be in place. Long-term impacts would be beneficial due to decreased contaminant loading to Paddys Run. The capping of the Solid Waste Landfill could release contaminants to Paddys Run during the rerouting of the drainageway north of the landfill. Long-term impacts would be beneficial because rainwater and runoff would be prevented from coming into contact with waste and

transporting contaminants to the river. Potential impacts of capping on sediment would be correlated with impacts on surface water in Paddys Run, but would be minor due to dilution. Beneficial impacts on sediment would consist of preventing any long-term releases of Operable Unit 2 contaminants to the Great Miami River.

Short-term minor impacts on the Storm Sewer Outfall Ditch could result due to runoff during capping of the Active Flyash Pile. Long-term impacts would be beneficial because rainwater and runoff would be prevented from coming into contact with waste and transporting contaminants to the ditch. Impacts on sediments in the outfall ditch would be correlated with impacts on surface water quality. Beneficial impacts on sediment would result from the prevention of any long-term releases of Operable Unit 2 contaminants to the outfall ditch.

The capping of the Solid Waste Landfill would require the rerouting of an emergent wetland drainage area north of the landfill. This would result in the short-term loss of approximately 0.08 hectares (0.2 acres) of wetland. Runoff/run-on control measures would be in place during cap construction to prevent the transport of waste unit material to the drainage. Long-term impacts of this alternative would be beneficial because releases of waste material to the drainage would be prevented. The potential relocation of Paddys Run for capping of the South Field and flyash piles would alter flow and drainage patterns within the floodplain of the stream.

G.2.2.2.3 Air Quality

A primary concern associated with air quality impacts is the entrainment of fugitive dust that could contain large amounts of radionuclides. Radionuclide-contaminated fugitive dust could result from excavation and construction activities associated with the realignment of drainage and runoff control systems, included in each alternative for all six waste areas. Fugitive dust could result from construction operations that would be required for capping of all waste areas. The in-place stabilization of the Lime Sludge Ponds could also result in fugitive dust.

Best management practices that are proposed for the control of fugitive dust include wet suppression, which is used to control fugitive dust emissions resulting from excavation, demolition, and materials/soils handling. With the implementation of this best management practice, the individual and cumulative air quality impacts of the waste unit alternatives should be minor. Existing air monitoring stations in and around the FEMP site would be used to

monitor concentrations of airborne particulates. The air monitoring system for the FEMP site is described in detail in the SWCR (DOE 1993d).

G.2.2.2.4 Biotic Resources Terrestrial Ecology

The capping of the Solid Waste Landfill, Lime Sludge Ponds, the flyash piles, and South Field would result in the short- and long-term disturbance and removal of approximately 2.0 hectares (5.0 acres) of introduced grassland and riparian habitat. Capping would also result in project-related noise and increased levels of human activity, which could disrupt nearby wildlife and reduce or eliminate use of the site by certain wildlife species. Impacts could include flushing behavior and other startle effects in nearby wildlife, such as birds and bats; diminished use of habitat and dispersal corridors; disruption of avian nesting efforts in the area during the spring months, and reductions in local wildlife populations. A beneficial impact of capping Operable Unit 2 waste units would be the long-term prevention of releases of Operable Unit 2 contaminants into the environment.

The capping of the Solid Waste Landfill would require realigning the drainage north of the landfill, resulting in the removal of emergent wetland habitat and reductions in associated wildlife populations. Potential realignment of Paddys Run and the Storm Sewer Outfall Ditch for capping of the flyash piles and South Field would result in the removal of successional and riparian woodland along the stream, with reductions in associated wildlife populations. Adverse impacts on state and federal threatened and endangered species, which occur or are potentially present at the FEMP site (Table G.2-3), could include removal and disturbance of riparian habitat along Paddys Run, disruption of breeding, and loss of individuals. Beneficial impacts would include elimination of any present contaminant releases and prevention of any future releases. A detailed survey for threatened and endangered species began in the summer of 1993 and is expected to completed by June 1994.

Aquatic Ecology. As described in Section G.2.3.2.3, there would be short-term losses of approximately 0.08 hectare (0.2 acre) of emergent wetlands and associated organisms north of the Solid Waste Landfill due to the rerouting of this drainage to install a cap. Based on the results of various recent studies, wetland vegetation and fauna would probably reestablish naturally in the relocated drainage within a year after remedial activities are complete, resulting in no net loss of wetland, as described in Section G.2.2.2.6. The aquatic organisms in the wetland areas in the vicinity of the Lime Sludge Ponds could be affected by equipment

TABLE G.2-3

THREATENED AND ENDANGERED SPECIES IDENTIFIED OR POTENTIALLY PRESENT AT THE FEMP SITE

Latin Name	Common Name	State Status	Federal Status	Occurrence at the FEMP Site
Trifolium stoloniferum	Running buffalo cover	Endangered	Endangered	Not found during spot checks; occurs at Miami Whitewater Forest—spread by grazing animals[a]
Digitaria filiformis	Slender finger grass	Endangered	Unlisted	Rare (0.3% cover), Paddys Run riparian woodlands, summer 1986[b]
Polygonum cilinode	Mountain bindweed	Endangered	Unlisted	Rare, Paddys Run riparian woodlands (0.3% cover), southern pine plantation (1.3% cover), summer 1986[b]
Myotis sodailis	Indiana bat	Endangered	Endangered	Not found during survey; colony exists on Banklick Creek[a]
Eurycea lucifuga	Cave salamander	Endangered	Unlisted	Not found during survey; population at Ross Trails Girl Scout Camp[a]
Circus cyaneus	Northern harrier	Endangered	Unlisted	One individual seen over pasture, summer 1986[b]
Buteo lineatus	Red-shouldered hawk	Special Interest	Unlisted	One individual seen over northern woodland, winter 1986-1987[b]
Seiurus noveboracensis	Northern waterthrush	Endangered	Unlisted	Present as spring migrant, 1987[b]
Junco hyemalis	Dark-eyed junco	Endangered	Unlisted	Common, winter 1986-1987[b]
Orconectes sloanii	Sloan's crayfish	Threatened	Unlisted	Present, winter 1986-1987[b]

[a] Draft Environmental Assessment, Mixed Waste Disposal Operations at NTS.
[b] Facemire et al., 1990, "Biological and Ecological Site Characterization of the FMPC," 1990.

SOURCE: Site-Wide Characterization Report, 1993.

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mobilization, citing of support facilities, and stabilization and capping activities. Short-term impacts include excessive dust accumulation on riparian vegetation and turbidity in the drainages. The long-term impacts could be loss of the wetlands in the drainages.

If realignment of Paddys Run and the Storm Sewer Outfall Ditch is required to implement this alternative, it could have a major affect on aquatic organisms and their habitats in Paddys Run. There would be losses of riparian and aquatic habitat and associated species due to the destruction of the stream banks and bed. If the stream banks were actively reestablished and the area were revegetated with natural species, habitat loss would only occur in the short term. Increased stream turbidity and contaminant exposure, resulting from construction runoff and relocation activities, could also adversely affect aquatic species in the short term. These impacts would be greatly reduced if construction activities were conducted in the dry season.

Remedial activities are not expected to have any adverse impacts on aquatic organisms in the Great Miami River due to the large dilution factor. In the long term, Operable Unit 2 remediation would be beneficial to aquatic organisms by minimizing or alleviating exposure to contaminants.

G.2.2.2.5 Wetlands and Floodplains

A site-wide delineation has identified several areas of wetlands on the FEMP site. Wetland impacts as a result of Operable Unit 2 remedial activities would be minimized by implementing best management practices during and following remediation. Proper notification and mitigative measures would be executed if impacts are expected to occur.

Impacts to the 100- and 500-year floodplain are expected to be minimal during Operable Unit 2 activities. Engineering controls, such as silt fences and berms, would be utilized to prevent any impacts.

G.2.2.2.6 Socioeconomics and Land Use

Employment for the proposed Operable Unit 2 capping alternatives varies based on task scheduling and the skills required. Capping activity for the South Field has the highest anticipated employment of the waste areas in Operable Unit 2, with an estimated 80 crew members required during the project. This requirement would not affect the Cincinnati

metropolitan area labor market, which is in excess of 925,000 workers. Some of the occupations needed include electricians, drivers, machinery operators, carpenters, cement masons, plumbers, and pipe fitters. As discussed by DOE (1993b), a majority of the essential skilled workers would be available in the Cincinnati labor market. However, some of the required highly skilled workers may be in shorter supply, such as Class 6 welders and electricians who work with power lines. These workers would have to be brought to the site on either a permanent or temporary basis, or local personnel would have to be trained for these highly skilled positions.

Because a large number of workers should not be expected to permanently relocate to the Cincinnati area as a direct result of the Operable Unit 2 remediation, there is no expected indirect impact to the local housing or service economies. A modest short-term impact should be expected to affect the service and housing economies close to the FEMP site, especially those associated with food and personal services and temporary housing. In the long term, there would be no anticipated impacts on the local or regional economies. One sector of the local economy that would experience direct impacts would be wholesale and retail sales, with particular emphasis on the provision of construction materials such as concrete, aggregate, and lumber. Indirect impacts on employment in these sectors would also be likely.

Both state and county transportation officials felt that a notification to their offices of any anticipated heavy use (over 1,000 one-way trips) of the roadways within their jurisdictions would be beneficial. In that event, local supervisors would more frequently inspect for heavy wear. The transport of construction materials to the FEMP site would create direct short-term impacts on the local area in terms of increased traffic congestion, increased noise, and road degradation. The impacts on the local roadways in terms of total weight to be transported to the FEMP site vary by waste unit. With the exception of the Solid Waste Landfill, capping requires greater amounts of materials than other alternatives. The material requirements for capping range from a low of 22,586 metric tons (24,896 tons) for the Solid Waste Landfill to a high of 412,159 metric tons (454,320 tons) needed for capping the South Field. Remediation of the South Field would have the greatest potential for a negative impact to the roadways.

In terms of the short-term impacts on the roadways and traffic patterns caused by number of trips to the FEMP site, the number of truck trips is based on the estimated time for

completion. With a potential for a total 28,496 trips to the site and an equal number of return trips that would average 219 daily one-way trips, the capping alternative for the South Field presents the greatest potential for negative impacts of the waste units. No long-term impacts would be expected on schools, health care facilities, housing, emergency and protective services, and water and wastewater treatment systems.

Archaeological surveys will be performed prior to disturbance and appropriate mitigation implemented. Future NEPA documentation will include detailed discussion of any potential impacts on these resources. As previously mentioned, the rainbow arch bridge over Paddys Run on Willey Road may be affected by transport of materials to the FEMP site.

G.2.2.2.7 Cultural Resources

A site-wide archeological survey would be performed for the areas to be impacted by Operable Unit 2 activities. Any significant activities from a cultural resources standpoint would be managed consistently with the requirements of the NHPA, OHPO, AIRFA, and NAGPRA. Because any cultural resources identified would either be avoided or managed appropriately, there would be no impacts to cultural resources at the FEMP site.

G.2.3 OPERABLE UNIT 3

Operable Unit 3 includes the former Production Area and all above ground and below ground production-associated facilities and equipment encompassing structures, utilities, drums, tanks, solid waste, waste, product, thorium, effluent lines, wastewater treatment and fire training facilities, scrap metal piles, feedstock, and coal pile.

The production of uranium metal products at the FEMP site involved a series of chemical and metallurgical conversions that occurred in nine specialized plants within Operable Unit 3. A number of other buildings housed support operations. Each of these facilities had a distinct purpose, resulting in important differences in the process operations, chemical forms, and types of individual conveyance, storage, and containment units associated with the respective facilities. The potential contaminants resulting from production activities are listed in Table G.2-4.

Solid waste materials associated with uranium metals production are presently stored on property in steel drums awaiting further processing or off-property disposal at approved

TABLE G.2-4

CONSTITUENTS OF CONCERN BY OPERABLE UNIT

OPERABLE UNIT 1[a]

Radionuclides
Cesium-137
Neptunium-237
Plutonium-238
Plutonium-239/240
Radium-228 + 1 dtr
Strontium-90 + 1 dtr
Technetium-99
Thorium-230
Thorium-232 + 10 dtr
Uranium-234
Uranium-235 + dtr
Uranium-238 + 2 dtr

Inorganic Chemicals
Antimony
Beryllium
Cadmium
Chromium
Manganese
Molybdenum
Mercury
Nickel
Silver
Thallium
Uranium
Vanadium

PCBs
Aroclor 1248
Aroclor 1254
Aroclor 1260

PAHs
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)floranthene
Benzo(k)fluoranthene
Chrysene
Indeno(1,2,3-cd)pyrene

VOCs
Tetrachloroethene
Vinyl Chloride

Polychlorinated Dibenzodioxins
2378 Tetra CDD
Hepta CDD
Hexa CDD
Octa CDD

Polychlorinated Dibenzofurans
Hepta CDF
Hexa CDF

OPERABLE UNIT 2[b]

Radionuclides
Strontium-90
Uranium-234
Uranium-235
Uranium-238

Inorganics
Boron
Cyanide
Manganese
Mercury
Molybdenum

Organics
1,1-Dichloroethane
1,2-Dichloroethene
1,1,1-Trichloroethane
1,1,2-Trichloro-1,2,2-Trifluoroethane
Trifluoroethane
2-Chlorophenol
4-Chloro-3-methyl phenol
Acetone
Benzoic acid
Carbon disulfide
Chlordane

OPERABLE UNIT 3[b]

Radionuclides
Uranium-234
Uranium-235
Uranium-238

Polychlorinated Dibenzofurans
Hepta CDF
Hexa CDF

OPERABLE UNIT 4[c]

Radionuclides
Actinium-227
Lead-210
Polonium-210
Protactinium-231
Radium-224
Radium-226
Radium-228
Strontium-90
Technetium-99
Thorium-228
Thorium-230
Thorium-232
Uranium-234
Uranium-235/236
Uranium-238

Inorganics
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Chromium
Cobalt
Copper
Cyanide
Lead
Manganese
Mercury
Molybdenum
Nickel
Selenium
Silver
Thallium
Uranium
Vanadium
Zinc

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TABLE G.2-4
(Continued)

OPERABLE UNIT 4[c] (Continued)	OPERABLE UNIT 5[b]
	Radionuclides
	Strontium-90
Organics	Technetium-99
2-Butanone	Uranium-234
2-Hexanone	Uranium-235
2-Nitrophenol	Uranium-238
4-Methyl-2-pentanone	
4-Nitrophenol	Inorganics
Acenaphtylene	Cyanide
Acetone	Mercury
Aldrin	
Anthracene	Organics
Aroclor-1248	1,1-Dichloroethane
Aroclor-1254	1,1-Dichloroethene
Aroclor-1260	1,1,2-Trichloroethane
Benzo(a)anthracene	1,2-Dichloroethane
Benzo(a)pyrene	1,2-Dichloroethene
Benzo(b)fluoranthene	2-Hexanone
Benzo(g,h,i)perylene	Benzoic acid
Benzoic acid	Bromodichloromethene
Bis(2-ethylhexyl)phthalate	Carbon disulfide
Carbon tetrachloride	N-Nitroso-di-propylamine
Chrysene	Tetrachloroethene
4,4'-DDE	Trichloroethene
4,4'-DDT	Vinyl chloride
Di-n-butyl phthalate	
Di-n-octyl phthalate	
Dibenzo(a,h)anthracene	
Dieldrin	
Diethyl phthalate	
Dimethyl phthalate	
Endosulfan I	
Endosulfan II	
Edrin	
Fluoranthene	
Heptachlor epoxide	
Indeno(1,2,3-cd)pyrene	
Methylene chloride	
N-nitroso-di-n-propylamine	
Phenanthrene	
Phenol	
Pyrene	
Tetrachloroethene	
Toluene	
Tributyl phosphate	
Xylenes (total)	

[a] SOURCE: Table F.2-1 in Appendix F to this FS Report
[b] Site-Wide Characterization Report, 1993.
[c] Final Operable Unit 4 Feasibility Study Report, 1994.

facilities. These wastes include oils, sludges, contaminated combustibles, filter cake, off-specification uranium or thorium tetrafluoride, and reject uranium trioxide. The drums sit on various pads and in warehouses and are inspected weekly. Contents of deteriorated drums are repackaged. Other wastes stored in drums on contained surfaces include spent decreasing solvents and material contaminated with PCBs. Estimated volumes of potentially contaminated materials are listed by component in Table G.2-5.

G.2.3.1 Leading Remedial Alternative for Operable Unit 3

The LRA for Operable Unit 3 involves the removal, treatment/decontamination, and disposal of contaminated materials to reduce the potential for contaminant migration. Decontamination and treatment residues would require further treatment and disposal. Contaminated materials will be disposed of in an on-property engineered above ground disposal facility, and clean materials will be free released for reuse or recycling. This facility would be located on FEMP site property within the EWMF (i.e., disposal facility) study area. The selection of this LRA is based on limited characterization and engineering study data and may change. This alternative also includes continued federal ownership of the land to control future land use. The following processes would occur:

- Removal - Buildings and structures will be mechanically removed to protect human health and to comply with ARARs. Waste segregation technologies will be employed to facilitate waste handling, treatment, packaging, and disposition/disposal.

  Limited in-place decontamination is anticipated for all materials exhibiting gross removable contamination to reduce worker exposures and minimize off-property release during demolition/dismantlement. Soils will be removed using mechanical equipment and processed as described in the Operable Unit 5 LRA (Section G.2.6). Equipment, drums, waste, and product will be removed, treated, and/or packaged to meet risk-based preliminary remediation goals (PRGs) and ARARs.

- Waste Treatment/Decontamination - Treatment options for containerized waste and bulk soil materials include the application of a wide range of technologies commensurate with the large quantities and types of waste and product materials in Operable Unit 3. Treatment options for containerized waste and bulk material include soil washing, cement-based stabilization, and vitrification. Equipment and building materials will be decontaminated, employing a range of available technologies including dry concrete scabbing, acid washing, and grit blasting. Soils will be treated as described in the Operable Unit 5 LRA. Ongoing treatability programs for the other four FEMP site operable units may provide important information pertinent to a

TABLE G.2-5

ESTIMATED VOLUMES OF OPERABLE UNIT 3 COMPONENTS (ft^3)

Component	Concrete	Cement Block	Steel	Transite	Other Metal	Soil/ Rubble	Asphalt	Other
Buildings (Structure)	1,692,394	295,288	31,493	40,096	0	0	0	39,435
Buildings (Content)	0	0	0	0	0	0	0	2,656,597
Containers	130,419	382	6,751	0	199	0	0	4,286
Bulk Material	0	0	2,000	0	550,000	981,000	0	189,000
Pads	440,890	0	2,059	0	0	0	445,708	33,792
Piping, etc	56,282	0	11,789	0	157	0	0	19,587
Ponds and Basins	5,139	0	312	0	0	0	0	13,373
Miscellaneous	40,762	0	3,502	0	0	0	0	9,011
TOTAL	2,365,886	295,670	57,906	40,096	550,356	981,000	445,708	2,965,081

SOURCE: Site-Wide Characterization Report, 1993.

number of the envisioned Operable Unit 3 waste types. Additional treatability studies are envisioned to support Operable Unit 3 to demonstrate the effectiveness of specific treatment and decontamination options.

- On-Property Disposal - Following treatment, volume reduction, and/or packaging, the resultant stable waste will be transferred from a temporary holding area to an on-property disposal facility at the FEMP site. The disposal facility would include a series of above ground reinforced concrete vaults, which will be underlain by a leachate collection and detection system and covered by a multimedia cap.
- Free Release/Recycle - Decontamination will be employed to the extent practical to maximize reuse and recycling of materials and minimize the requirement for disposal. Materials meeting free release criteria of DOE Order 5400.5 may be distributed for recycling or reuse to commercial vendors or disposed of at public landfills. Some materials may be released to other DOE facilities for controlled recycling and reuse.

G.2.3.2 Environmental Consequences for Operable Unit 3 Remediation

Potential impacts on air quality, groundwater, surface water, soils, terrestrial and aquatic ecology, threatened and endangered species, and social systems from implementation of the LRA for Operable Unit 3 are discussed in this section.

G.2.3.2.1 Soil and Geology

The mechanical removal of buildings and other structures in the former Production Area poses the greatest short-term threat to surface soils. Loose contamination on the structures could be released with dust during removal processes and be dispersed onto the ground surface. However, steps would be taken to minimize contaminant releases during the demolition of buildings and structures. This would include removing loose contamination from the buildings. Also, much of the surface soil currently covering the former Production Area would be excavated and treated under Operable Unit 5 remedial activities. Therefore, the impacts on surface soils from the removal of buildings and structures should be minimal.

If contaminants remain on the ground surface for extended periods of time, infiltration of rainwater or storm water runoff could cause migration of the contaminants into the subsurface soils. Judging from existing conditions, it is unlikely that major impacts on the subsurface soils would occur. Uranium concentrations in the former Production Area decrease sharply with depth, indicating that the transport of uranium through the soil is minimized by retardation factors.

The removal of contaminated structures from the former Production Area, along with waste treatment and decontamination, should have beneficial long-term effects on both surface and subsurface soils due to the removal of contaminant sources.

G.2.3.2.2 Water Quality and Hydrology Groundwater

The removal of buildings, structures, and contaminated soils in the former Production Area poses the greatest short-term threat to groundwater quality. If contaminants are dispersed onto the ground surface during the removal processes they could migrate into the glacial overburden through rainfall infiltration or become part of contaminated storm water runoff.

Infiltration of contaminants through the glacial overburden is the most likely threat to groundwater quality during the removal processes. The glacial overburden beneath the former Production Area ranges from 7 meters to 12 meters (23 to 40 feet) thick (DOE 1990b). Due to the thickness of this layer, short-term impacts from infiltration would likely be confined to the perched groundwater.

The general pattern indicated by borings in the former Production Area is that there are very few sand lenses under the eastern half of the former Production Area. Those that are present are small and discontinuous as compared to those under the western half. The southwest portion of the former Production Area is generally underlain by weathered clays resting on interfingering silt and sand lenses. The combination of deep weathering and the presence of relatively high permeability silt and sand results in a zone of relatively high vertical and lateral permeability. Therefore, perched groundwater is pervasive in this area. This is also the area that is likely to experience the greatest short-term impacts from infiltration of contaminants during structure removal processes.

Mitigation measures would be necessary to minimize contaminant releases during the demolition/dismantlement of buildings and structures; therefore, it is unlikely that contaminants would be available in sufficient quantities to have long-term impacts on the perched groundwater.

Storm water runoff controls at the site have been upgraded and continue to be upgraded through ongoing removal actions. For contaminants to migrate to the Great Miami Aquifer through storm water runoff, the contaminated runoff must reach Paddys Run or the Storm

Sewer Outfall Ditch and infiltrate through the streambeds to the aquifer. It is unlikely that contaminants introduced to the storm water from removal of structures in the former Production Area would migrate by this pathway to the aquifer in quantities sufficient to produce noticeable impacts.

The removal of contaminated structures from the former Production Area, along with waste treatment and decontamination, should have beneficial long-term effects on both perched and regional groundwater due to the removal of contaminant sources.

Surface Water. Potential adverse impacts on surface water could occur from the release of contaminants into runoff during demolition and removal. Long-term impacts would be beneficial because Operable Unit 3 wastes would be isolated from rainwater and runoff, eliminating the potential transport of contaminants to surface water and wetlands.

Indirect short-term impacts of waste removal could occur as a result of building demolition, waste removal, and packaging activity on the site. Impacts would be associated with runoff transporting contaminants to surface water. Adverse impacts of waste removal on sediments would be correlated with impacts on surface water quality. Beneficial impacts on surface water and sediments would consist of preventing any long-term releases from Operable Unit 3 waste areas.

Short-term adverse impacts of waste removal on wetlands in drainages adjacent to Operable Unit 3 would consist of physical disturbance by heavy equipment and contamination by erosion of exposed waste. However, these wetlands are limited to a few acres. Long-term beneficial impacts on these wetlands would occur as a result of eliminating future contamination by Operable Unit 3 wastes. Contaminated Operable Unit 3 material could be disposed of at an on-property disposal facility or at an off-site facility. On-property disposal could have short-term impacts on surface water and wetlands during construction of the disposal facility. Potential impacts are associated with contaminated runoff and potential loss of wetlands due to filling or rerouting of drainageways. One wetland area of particular concern is the 20-ha (50-acre) forested wetland located in the northern part of the FEMP property. Long-term impacts are expected to be beneficial because FEMP site wastes would be treated and isolated from contact with rainwater and runoff, eliminating the transport of contaminants to surface water and wetlands.

Off-property disposal would have a beneficial impact on surface water and wetlands because wastes would be removed from the FEMP site and transported to an approved facility for final disposal. The transport of contaminants to surface water would be eliminated.

G.2.3.2.3 Air Quality

A potential for short-term, adverse air quality impacts exists due to waste removal, waste treatment, decontamination, and disposal/recycle activities proposed for Operable Unit 3. The constituents of concern include wind-blown, contaminated dust and volatilized contaminants, especially those generated from treatment residues that require further treatment and disposal.

Waste removal by mechanical means can generate airborne particulate matter (e.g., contaminated dust), which will disperse in the downwind direction. Plumes of particles will be at or near ambient temperature and will, therefore, travel near ground level and could be subject to inhalation by workers. Particles eventually settle to the ground but could remain suspended long enough to be carried across the FEMP property boundary. Waste treatment activities pose a potential for release of gaseous contaminants as well as dry stabilizing materials during materials handling. On-property or off-site disposal of unconfined waste, if any, would present a potential for fugitive dust release as the waste is loaded onto trucks, transported, and unloaded at the disposal facility or at a selected off-property disposal site.

Dust suppression can be used to control fugitive dust emissions, and it can be accomplished by a variety of methods that reduce contact between wind and potential airborne particles. The most common method is some form of liquid or surfactant (such as water or asphaltic compounds) which can be sprayed over soil surfaces to form crusts or to bond particles together.

If vitrification is used in the treatment processes, short-term, adverse air quality impacts could result from the off-gas generated. Also, the process could generate small amounts of particulate matter as the conductive mixture of flaked graphite and glass frit is applied to the waste before electrode insertion. A hood placed over the vitrified waste can be used to control particulates and direct the gaseous effluents to an off-gas treatment system, if necessary. The proposed waste removal, treatment, decontamination, and disposal processes will have little or no adverse long-term impacts on air quality in the region of the FEMP site because of comparatively rapid settling velocities of particulate matter and rapid dilution of

volatilized gases in the ambient air. Disposal of the wastes in a disposal facility or off-site disposal facility should present no long-term adverse impacts on air quality because the wastes will be prepackaged and not exposed to wind erosion.

G.2.3.2.4 Biotic Resources Terrestrial Ecology

Demolition and removal could result in short-term adverse impacts on terrestrial ecology. These impacts are associated with project-related noise and increased levels of human activity, potentially disrupting nearby wildlife and reducing or eliminating use of the site by certain wildlife species. Impacts could include flushing behavior and other startle effects in nearby wildlife such as birds and bats; diminished use of habitat and dispersal corridors; and disruption of avian nesting efforts in the area during the spring months. The above impacts would be short term and would cease after the completion of remedial activities. No habitat is expected to be removed or disturbed during waste removal or treatment. Long-term beneficial impacts of waste removal/treatment on terrestrial ecology include the elimination of present contaminant releases and prevention of any future releases into the environment.

The on-property disposal of Operable Unit 3 wastes in a disposal facility would result in short-term and long-term adverse and long-term beneficial impacts on terrestrial ecology. Short-term impacts associated with this strategy include the removal and disturbance of vegetation/habitat for staging areas and construction of support facilities. Removal of habitat would result in correlated reductions of local wildlife populations. Citing of the disposal facility could require realigning and/or filling on-property drainages containing emergent wetland vegetation with reductions in associated wildlife populations. Adverse impacts on state and federal threatened and endangered species that occur or are potentially present on the FEMP site could include the removal and disturbance of habitat, disruption of breeding activities, and loss of individuals, depending on the location of a disposal facility. A detailed survey for threatened and endangered species began in the summer of 1993 and is expected to be completed by June 1994. If necessary, a mitigation action plan will be developed to avoid impacts to any potentially affected species, and mitigation commitments will be included in the ROD for Operable Unit 3.

Long-term impacts associated with on-property disposal include the removal and disturbance of vegetation and habitat, resulting in correlated reductions of local wildlife populations.

Long-term beneficial impacts of this strategy on terrestrial ecology include the elimination of present contaminant releases and prevention of any future releases.

Aquatic Ecology. Due to the mechanical removal of contaminated soils, a small possibility exists that aquatic organisms in Paddys Run could be affected in the short term via release of contaminant flow from the Storm Sewer Outfall Ditch. Performing remedial activities when flow in this drainage is low or nonexistent would reduce or eliminate any potential adverse effects on aquatic organisms in Paddys Run. The emergent wetland drainages at the northern boundary of Operable Unit 3 are likely to be adversely affected in the short term as a result of physical disturbance during the removal, treatment, and decontamination of various facilities. If the affected area is fairly small, the wetland community in the drainages would likely soon recover naturally after activities are completed. Construction of a disposal facility could also have short-term adverse affects on organisms in Paddys Run from runoff, resulting in high turbidity. Aquatic organisms in adjacent wetland areas could also be adversely affected if wetland drainages are filled or rerouted. The 20-hectare (50-acre) tract of forested wetland in the northern portion of the FEMP site is of particular concern since loss of wetlands would be irretrievable.

G.2.3.2.5 Wetlands and Floodplains

The site-wide wetlands delineation has identified several areas of wetlands on the FEMP site. Best management practices would be utilized to avoid wetland areas; however, any wetlands to be impacted by Operable Unit 3 remedial activities would be mitigated appropriately. The 100-year and 500-year floodplain is not expected to be impacted as a result of Operable Unit 3 activities. Engineering controls would be employed to lessen impacts to the floodplain area.

G.2.3.2.6 Socioeconomics and Land Use

Waste removal alternatives do not usually require a large number of workers for implementation and, therefore, would not affect the local labor market. The crew size and number of crews required for remedial activity for Operable Unit 3 have yet to be determined. Impacts on the local economy would have to be assessed in the NEPA documentation for Operable Unit 3. There would be no anticipated impacts on the local transportation systems resulting from building and structure removal activities. On-property traffic is expected to be disturbed during demolition activities. Removing the structures and buildings would be perceived by the local residents as beneficial, with reservations concerning

potential accidents or contaminant releases during the removal process. Removal of buildings and structures on the FEMP site would not affect any known historic or archaeological resources. Archaeological surveys will be performed prior to disturbance and appropriate mitigation implemented. In the long term, this removal would be beneficial to the local economy because the threat to human health and the environment would be reduced, and visual impacts would be reduced.

Potential impacts resulting from waste treatment vary with the treatment used. In situ vitrification requires considerable electric power during the process. Contact would need to be made with local electric utilities to assure that the necessary power is available with no reduction in service to local residential, commercial, and other industrial users. In situ vitrification and incineration could result in large quantities of airborne waste-contaminated particles and possibly harmful gasses if the processes are not properly enclosed or vented. This type of emission could have a negative impact on the local economy. Waste treatment processes that result in waste reduction or recycling, such as the proposed separation of Operable Unit 3 materials, would have a beneficial long-term impact to the local economy. The amount of wastes to be stored locally or transported through the area for alternatives involving treatment is lessened, and the recycling or reuse of free release wastes (wastes determined to be safe for distribution/release to the public or other agencies) could lower remediation costs over the long run. Other treatment processes, such as shallow soil mixing and cement-based stabilization, would not have an impact on the local economy.

G.2.3.2.7 Cultural Resources

A site-wide archeological survey would be performed for the areas to be impacted by Operable Unit 3 activities. Any significant activities from a cultural resources standpoint would be managed consistently with the requirements of the NHPA, OHPO, AIRFA, and NAGPRA. Because any cultural resources identified would either be avoided or managed appropriately, there would be no impacts to cultural resources at the FEMP site.

G.2.4 OPERABLE UNIT 4

Waste units in Operable Unit 4 consist of: two earthen-bermed concrete silos (Silos 1 and 2) containing K-65 residues, which are high-specific-activity, radium-bearing residues resulting from the pitchblende refining process; one concrete silo containing metal oxides (Silo 3); and one unused concrete silo (Silo 4). All silos are located south of the Waste Pit Area (Figure

G.2-1). The domed waste storage silos measure 24 meters (80 feet) in diameter, 11 meters (36 feet) high to the center of the silo dome, and 8 meters (27 feet) to the top of the vertical walls. The walls are 0.2-meters (8-inches) thick concrete as are the outer part of the domes, which taper to 0.1 meters (4 inches) in thickness at the center. Silos 1 and 2 are surrounded by an earthen berm to a height of approximately 7.9 meters (26 feet), while Silos 3 and 4 are free-standing.

Silos 1 and 2 were used for the storage of radium-bearing residues formed as by-products of uranium ore processing from 1952 to 1959. Waste raffinates were pumped into the silos where the solids would settle. The free liquid was decanted through a series of valves placed at various levels along the height of the silo wall. Settling and decanting continued until the silos were filled to approximately 1.2 meters (4 feet) below the top of the vertical wall (Table G.2-6). The concentration of each radionuclide at each of the 16 air monitoring sites details the volumes and types of waste associated with Operable Unit 4.

Corrective actions have been performed to maintain the integrity of Silos 1 and 2. These included repairing the walls and constructing a berm on a 1 1/2-to-1 slope (mid-1960s) and enlarging the berm to a 3-to-1 slope in the early 1980s. In 1985, a structural assessment was performed that revealed that the walls and base slab were structurally stable and could function as a containment of dry solids for a period of 10 to 15 years. However, the center 6-meters (20-feet) section of the dome was determined to be structurally unsound for a load greater than the existing static load. Remedial actions taken since 1985 include placement of protective covers constructed of steel and plywood over the center portion of each silo dome; 0.08 meters (3 inches) of rigid polyethylene foam topped by a 45-mil waterproof, ultraviolet-resistant, urethane-finish coating was placed over each silo dome in 1987 to provide weather protection and insulation. A Radon Treatment System was implemented for this project to reduce radiation exposure to the workers during the installation process. In 1991, a layer of bentonite clay was inserted over the residues in Silos 1 and 2 to reduce radon levels in the silos and to provide protection in the event of silo dome collapse. This was done under a removal action.

Silos 3 and 4 were constructed in 1952 and were designed to receive dry materials only. Waste raffinate slurries from refinery operations were dewatered in an evaporator and spray

TABLE G.2-6
OPERABLE UNIT 4 WASTES

Component	Volume (yd^3)(m^3)		
	Silo 1	Silo 2	Silo 3
Bentonite/Grout Cover	465/356	411/314	NA[a]
K-65 Residues	4291/3281	3720/2844	NA
Calcine	NA	NA	5200/3976
Structures	460/352	460/352	460/352
Material Below Silos and Berms[b]	230/176	60/46	500/382
Contaminated Soil	6100[c]/4664	NA	NA
Total[d]	5446/4164	4651/3556	6160/4710

[a] NA, not applicable
[b] Includes gravel, asphalt, clay, pipes, and decant sump.
[c] Total for Silos 1 and 2.
[d] Does not include contaminated soil.

SOURCE: Site-Wide Characterization Report, 1993.

calcined to produce a dry waste form for storage in the silo. The waste was blown in under pressure to fill Silo 3, but Silo 4 was never used and remains empty today.

G.2.4.1 Preferred Alternative for Operable Unit 4

There are three preferred subunit alternatives for the remediation of Operable Unit 4. The preferred alternative for the contents of Silos 1 and 2 involves the removal of the contents, stabilization by vitrification and off-site disposal at NTS. The preferred alternative for Silo 3 contents is identical to the Silos 1 and 2 contents alternative. The final preferred alternative involves the removal, decontamination, and on-property disposal of Silos 1, 2, 3 and 4 structures, berms, Silos 1 and 2 subsoils, decant sump tank, process piping, and the process piping trenches. Waste would be packaged and disposed of in a disposal facility constructed on property. More detail on these alternatives is provided in Section 4.0 of the FS Report for Operable Unit 4.

G.2.4.2 Environmental Consequences of Operable Unit 4 Remediation

This section summarizes the environmental impacts of the preferred remedial alternative for the contents of Silos 1, 2, 3, and 4 and for the associated structures and berms.

G.2.4.2.1 Soil and Geology

Removal of wastes from Silos 1, 2, and 3 would temporarily disturb approximately 3.16 hectares (8 acres) of soils. These areas would be regraded and returned to their previous condition following remediation. Construction of a disposal facility for the berm soils and silo structures would result in the permanent disturbance of approximately 3 hectares (7.5 acres) of soils, 0.7 percent of the land area of the FEMP site. No impacts are anticipated on the regional geology of the area as a result of Operable Unit 4 remedial activities.

G.2.4.2.2 Water Quality and Hydrology/Groundwater

No short-term impacts on groundwater are expected as a result of implementing the preferred alternative for Operable Unit 4. Long-term impacts would be beneficial by eliminating any potential releases of Operable Unit 4 constituents to groundwater. Existing groundwater monitoring systems at the FEMP site would be used to detect any impacts of Operable Unit 4 remediation on groundwater, allowing appropriate corrective actions to be taken. Upon completion of the remediation of Operable Unit 4, impacts to groundwater from Operable Unit 4 residual contaminants would be minimal.

Surface Water. Potential short-term impacts of Operable Unit 4 remedial activities on Paddys Run include fugitive dust and runoff from berm soils and disturbed areas. These impacts would be minimized by good engineering practices and runoff controls e.g., berms and dust suppressants. Long-term impacts would consist of eliminating Silos 1, 2, and 3 as potential sources of contamination. Current impacts of Operable Unit 4 on the Great Miami River are minimal and would be expected to remain so during and after remediation.

G.2.4.2.3 Air Quality

Potential short-term impacts of Operable Unit 4 remedial activities include fugitive dust and emissions resulting from transportation and construction, and releases of waste from Silos 1, 2, and 3 during waste removal. Fugitive dust and emissions would be controlled by routine mitigative measures e.g., water sprays. Any potential for waste releases would be minimized by conducting waste removal activities through a glove bag, within which negative pressure would be maintained. Air within the glove bag would be circulated through the Radon Treatment System and high-efficiency particulate air (HEPA) filters to further ensure that no contaminants could be released to the outside air.

Long-term impacts of removing wastes from Silos 1, 2, and 3 would be beneficial by eliminating potential releases of radon and other contaminants to the air. Upon completion of the remedial action, Operable Unit 4 would contribute very little of the carcinogenic risks associated with the post remediation site. Less than four percent of radionuclide emissions would come from Operable Unit 4 under current land use scenarios. One of the major pathways identified in the Operable Unit 4 Comprehensive Response Action Risk Evaluation, Appendix K of the Operable Unit 4 FS Report, is the inhalation of dust. However, because the majority of the Contaminants of Concern would be removed off site or isolated in vaults, residual risks associated with the Operable Unit 4 material would be expected to be minimal.

G.2.4.2.4 Biotic Resources/Terrestrial Ecology

Removal of wastes from Silos 1, 2, and 3 and the subsequent disposal of the silo berms and structures on the FEMP site would result in the short-term disturbance of approximately 3.16 hectares (8 acres) and the long-term loss of approximately 3 hectares (7.5 acres) of terrestrial habitat. The areas subject to short-term disturbance would be regraded and returned to their previous grassland condition. No threatened or endangered species are known to be present in the areas that would be disturbed. A detailed survey for threatened and endangered species

began in the summer of 1993 and is expected to be completed by June 1994. If necessary, a mitigation action plan will be developed to avoid impacts to any potentially affected species, and mitigation commitments will be included in the Record Of Decision (ROD).

Aquatic Ecology. Potential impacts on aquatic organisms would be indirect impacts on surface waters. Short-term impacts on surface water would be minimized by good engineering practices and runoff controls. Long-term impacts would be beneficial by eliminating any potential exposure of aquatic organisms to Operable Unit 4 constituents.

G.2.4.2.5 Wetlands and Floodplains

A site-wide wetlands delineation has identified several areas of wetlands in or adjacent to areas that could be impacted by the construction of the on-property disposal facility. Wetlands north and south of the treatment facilities are not expected to be affected. Approximately 5.0 hectares (12.4 acres) of forested wetlands could be affected in the northern part of the site. Engineering controls throughout site activities, such as silt fences and straw bales, would be used to minimize the migration of eroded soil to wetland areas. The 100-year and 500-year Paddys Run floodplain is located immediately west of Silos 1 and 2. On-property disposal activities are not planned to occur within the floodplain. Contaminant migration during remediation would be controlled through engineered erosion controls to minimize impacts on the floodplain.

G.2.4.2.6 Socioeconomics and Land Use

No major short-term or long-term impacts on the local economy, transportation, or land use are expected as a result of implementing the preferred alternatives for Operable Unit 4. The Operable Unit 4 remedial action could result in a minor increase in the FEMP site work force on a temporary basis. In addition, truck traffic to and from the site could increase by approximately 90 truck trips per work day for the duration of the remedial action. This traffic would result in some increases in dust and noise adjacent to the site. An archaeological survey would be performed for areas potentially affected by Operable Unit 4 remedial activities.

G.2.4.2.7 Cultural Resources

A site-wide archeological survey would be performed for the areas to be impacted by Operable Unit 4 activities. Any significant activities from a cultural resources standpoint

would be managed consistently with the requirements of the NHPA, OHPO, AIRFA, and NAGPRA. Because any cultural resources identified would either be avoided or managed appropriately, there would be no impacts to cultural resources at the FEMP site.

G.2.5 OPERABLE UNIT 5

The components of Operable Unit 5 include groundwater, surface water, soils, sediment, flora, and fauna and are described in detail in the SWCR (DOE 1993d). Estimates of the quantities of groundwater and soil requiring remediation will be provided in the RI Report for Operable Unit 5.

G.2.5.1 Leading Remedial Alternative for Operable Unit 5

The LRA for Operable Unit 5 involves the extraction of contaminated groundwater, treatment at an on-property facility, and discharge of the treated effluent to the Great Miami River through the newly constructed effluent line. Treatment residuals will be disposed of in an on-property engineered above-ground disposal facility. The LRA also involves the excavation of contaminated sediment/soils necessary to meet risk-based preliminary remediation goals (PRGs) and ARARs, transport to an on-property location for treatment using a fluidized soil washing technique, and returning the treated materials as backfill. The soil washing fluids will be recycled and the removed contaminants will be stabilized and disposed of in the on-property facility, which would be located within the Engineered Waste Management Facility (EWMF) study area. This alternative also assumes continued federal ownership of the land to control future land use. The following processes would occur:

- Groundwater Extraction - Five recovery wells installed in the regional aquifer as part of the South Plume removal action will be supplemented with several additional wells. Each well is estimated to produce a average flow rate of 0.04 cubic meters per second (650 gallons per minute). Groundwater extraction will continue until risk-based preliminary remediation goals (PRGs) and ARARs for the regional aquifer are met.

  Perched groundwater will be extracted using french drains, a wellpoint system, and extraction wells. Perched groundwater extraction will continue until risk-based preliminary remediation goals (PRGs) and ARARs for perched groundwater are met.

- Groundwater Treatment - Groundwater treatment will include a carbon adsorption pretreatment step, followed by precipitation for metals removal, ion exchange for uranium removal, and sludge dewatering. The system may be designed to process up to 0.5 cubic meters/second (8,000 gallons per

minute), reducing contaminant concentrations to levels necessary to meet risk-based preliminary remediation goals (PRGs) and ARARs. The treated water will be discharged to the Great Miami River, and the sludge generated by the treatment system will be stabilized as necessary and disposed of in an on-property disposal facility.

- Soil Removal - Soils will be excavated using traditional heavy construction equipment and techniques. Some deviations from standard excavation techniques may be necessary for excavation around and under facilities that may remain after Operable Unit 3 remediation. Soils in the contaminated zones will be excavated to meet risk-based preliminary remediation goals (PRGs) and ARARs. Those excavated soils that contain constituents below the remediation goals (based upon analysis) will be separated and used as backfill.
- Waste/Soil Treatment - After removal, the soils may go through solids processing (sorting, shredding, and/or compaction) to facilitate transport and on-property stockpiling for treatment by soil washing. The soil washing process will extract uranium and organic/inorganic contaminants from the sediment/soil using a liquid medium as the washing solution. Following the initial sorting and preparation in a rotating drum or a vibrating screen device, the larger pieces of soil/sediment are placed in a countercurrent chemical extractor. Here, additional washing fluid is passed countercurrent to the soil/sediment flow, removing the contaminants. The treated solids are then dewatered. The remainder of the process is a multi-step treatment for removal of contaminants from the washing fluid prior to its recycling. Although the treated soils and sediments can be safely backfilled at the FEMP site, the treatment sludges will contain concentrated contaminants and will require disposal in an on-property disposal facility.
- On-Property Disposal - Following treatment, volume reduction, and packaging, the resultant stable waste will be transferred from a temporary holding area to an on-property disposal facility. The disposal facility is envisioned to include a series of above ground reinforced concrete vaults, which will be underlain by a leachate collection and detection system and covered by a multimedia cap.

G.2.5.2 Environmental Consequences for Operable Unit 5 Remediation

Potential impacts on air quality, groundwater, surface water, soils, terrestrial and aquatic ecology, threatened and endangered species, and social systems from implementation of the LRA for Operable Unit 5 are discussed in this section.

G.2.5.2.1 Soil and Geology

Impacts on surface soil from the Operable Unit 5 LRA would be limited to the soil removal and treatment processes. Overall, these processes would be beneficial to soils. The only short-term negative impact may be from spills during transport of contaminated soils to the treatment facility. These spills could have minor localized impacts on surface soils. However, soil contaminated by a spill could be cleaned up along with the spill, eliminating the potential for contaminant migration.

The removal of contaminated soils would have a beneficial effect on subsurface soil due to the removal of contaminant sources. Pumping and treatment of the contaminated perched and regional groundwater should stop contaminant migration in the subsurface soils.

G.2.5.2.2 Water Quality and Hydrology Groundwater

The LRA for Operable Unit 5 includes the removal and treatment of contaminated groundwater, specifically regional groundwater in the South Plume and perched groundwater in the areas of Plant 2/3, Plant 6, Plant 9, and the Pilot Plant. A potential negative impact associated with the removal process would be the slight risk of vertical migration of contaminants during the construction of extraction wells within the contaminant plume. However, well construction techniques, such as using casing during the drilling process, are designed to minimize this possibility, and any additional migration of contaminants should be reversed once extraction is begun.

The possibility of subsidence occurring as a result of the dewatering of sands, silts, or clays in the Great Miami Aquifer is remote. Groundwater fills pore spaces and does not provide a support structure; therefore, dewatering would not change the engineering capacity of sediments to support their own weight or overburden. In addition, groundwater elevations naturally fluctuate from season to season without subsidence occurring.

Pumping and treatment of the contaminated regional groundwater in the South Plume should stop the continued migration of the plume. Pumping and treatment of the perched groundwater in the former Production Area should reduce existing levels of hazardous constituents being supplied to the aquifer and reduce the risk of further migration within the glacial overburden. These are beneficial short- and long-term impacts on groundwater.

The removal of contaminated soils will also have both short- and long-term beneficial impacts on groundwater by removing the source of contaminants. Based on findings in the Operable Unit 4 CRARE, residual uranium in site-wide soils would be the primary contributor to long-term cancer risks through the groundwater pathway. However, in general, these long-term residual risks are well within the target range of 10^{-6} to 10^{-4} under all scenarios. This pathway is evaluated in the Operable Unit 4 CRARE and will be evaluated in more detail in the Operable Unit 5 FS/PP-NEPA evaluation.

Surface Water. Potential adverse impacts on surface water could occur from erosion of contaminated soils into surface waters, excavation of contaminated sediments, and physical disturbance and contamination of wetlands. Long-term impacts would be beneficial because contaminated Operable Unit 5 soils and sediments would be isolated from rainwater and runoff, and contaminated groundwater in the aquifer would be prevented from reaching the Great Miami River over the long term. Impacts on surface water are not anticipated as a result of extraction of contaminated groundwater because the water would be treated prior to discharge to the river. Long-term beneficial impacts on surface water would consist of prevention of any future discharge of contaminated groundwater in the regional aquifer to the Great Miami River, and elimination of present contaminant releases via erosion and runoff from contaminated soils.

Removal of Operable Unit 5 soils would have only minor impacts on surface water quality. Impacts from removal of contaminated sediments from the Storm Sewer Outfall Ditch and Paddys Run could be major but temporary if a heavy rainfall occurred during removal. Excavation of contaminated soils and sediments would have minor short-term impacts on the 100- and 500-year floodplain of Paddys Run, but excavation activities would not alter flow patterns or the uses of the floodplain.

The on-property disposal of excavated soils and sediment could have short-term impacts on surface water and wetlands during construction of the disposal facility. Potential impacts are associated with contaminated runoff and potential loss of wetlands due to filling or rerouting of drainageways. One wetland area of particular concern is the 20-hectares (50-acre) forested wetland located in the northern part of the FEMP property. Long-term impacts are expected to be beneficial because contaminants would be treated and isolated from contact with

rainwater and runoff, eliminating the transport of contaminants to surface water and wetlands.

G.2.5.2.3 Air Quality

The excavation and removal of contaminated sediment could generate short-term contaminant-laden fugitive dust. The amount of fugitive dust generated would depend upon waste characteristics, such as waste constituents and moisture content; meteorological factors, such as wind speed and atmospheric density; and other site conditions such as particle-size distribution and the extent of vegetative cover. Wet suppression can be used to control fugitive dust.

Long-term impacts to air quality associated with Operable Unit 5 could result from airborne emissions of residual (i.e., post-remediation) contaminants originating from site-wide soils. The Operable Unit 4 CRARE (Appendix K of the Operable Unit 4 FS/PP-EIS) has evaluated the potential for residual cancer risks to on-site and off-site receptors under various scenarios for use of the FEMP site after remediation. Based on the results of the CRARE, site-wide soils will contribute over 99 percent of the radiological emissions after completion of the remedial action. However, the risks levels associated with radiological emissions and the inhalation pathway are within the target range of 10^{-6} to 10^{-4} for the majority of receptors using a current land use or a future land use whereby the government owns the land. Under a future land use scenario where the Fernald site would be privately owned, risks associated with the inhalation of particulates containing uranium produce risks above the 10^{-4} for on-property receptors only.

G.2.5.2.4 Biotic Resources/Terrestrial Ecology

Groundwater remediation is not expected to result in adverse impacts on terrestrial ecology. Removal and treatment of Operable Unit 5 soils and contaminated sediment from the Storm Sewer Outfall Ditch and Paddys Run would result in short-term adverse and long-term beneficial impacts on terrestrial ecology. Short-term impacts include the removal and disturbance of vegetation/habitat for staging areas and the physical removal of soils. Removal of habitat would result in correlated reductions of local wildlife populations. Project-related noise and increased levels of human activity could disrupt nearby wildlife and reduce or eliminate use of the site by certain wildlife species. Impacts could include flushing behavior and other startle effects in nearby wildlife such as birds and bats; diminished use of habitat and dispersal corridors; and disruption of avian nesting efforts in the area during the spring

months. The above impacts would be short term and would cease after the completion of remedial activities. Long-term beneficial impacts include the elimination and future prevention of exposure of terrestrial organisms to contaminated soils and sediments.

The on-property disposal of Operable Unit 5 soils and sediments in a disposal facility would result in short-term and long-term adverse and long-term beneficial impacts on terrestrial ecology. Short-term impacts include the removal and disturbance of vegetation and habitat for staging areas and construction of support facilities. Removal of habitat would result in correlated reductions of local wildlife populations.

Citing of the disposal facility would require realigning or filling of on-property drainages containing emergent wetland vegetation with reductions in associated wildlife populations. Adverse impacts on state and federal threatened and endangered species that occur or are potentially present on the FEMP site could include the removal and disturbance of habitat, disruption of breeding activities, and loss of individuals, depending on what areas require excavation and where the disposal facility is sited. A detailed survey for threatened and endangered species began in the summer of 1993 and is expected to be completed by June 1994. If necessary, a mitigation action plan will be developed to avoid impacts to any potentially affected species and mitigation commitments will be included in the ROD. Long-term impacts associated with on-property disposal include the removal and disturbance of vegetation and habitat, resulting in correlated reductions of local wildlife populations. Long-term beneficial impacts of this alternative to terrestrial ecology include the elimination and future prevention of exposure of terrestrial organisms to contaminated soils and sediment.

Aquatic Ecology. No short-term adverse impacts on aquatic ecology are anticipated as a result of groundwater remediation because the water would be treated before discharge. In the long term, preventing contaminated groundwater from release to the Great Miami River would be beneficial by eliminating any potential exposure.

The excavation and removal of contaminated sediments from several sections of Paddys Run and the Storm Sewer Outfall Ditch could have short-term impacts on aquatic organisms, including potential exposure to contaminants, increased turbidity, and physical destruction. However, the areas excavated would be fairly short, approximately 31 meters (100 feet) in length, and repopulation sources would exist upstream and downstream in Paddys Run.

Sediment excavation is expected to have minor, short-term impacts on aquatic organisms in the Great Miami River, primarily from turbidity. Dilution of Paddys Run flow into the river would likely minimize any impacts.

G.2.5.2.5 Wetlands and Floodplains

A site-wide delineation has identified several areas of wetlands on the FEMP site. Wetland areas would be avoided if possible during Operable Unit 5 activities. Any impacts to wetlands as a result of Operable Unit 5 activities would be mitigated appropriately.

The 100- and 500-year floodplain of Paddys Run is not expected to be impacted during Operable Unit 5 activities. Best management practices and engineering controls would be implemented to minimize impacts to floodplain areas.

G.2.5.2.6 Socioeconomics and Land Use

Groundwater remediation would not have any impact on the local labor force or transportation systems. However, implementation of intensive pump-and-treat techniques could have a significant effect on the well yield in the surrounding areas. It would have a long-term beneficial impact on the local economy by allowing the previous users of the now-contaminated portions of the Great Miami Buried Valley Aquifer to use wells again and by allowing additional withdrawal from that portion of the aquifer for additional residential, commercial, or industrial use. Any impacts the contamination has had on development in the area would be nullified in the long term, while short-term impacts on development would continue. Groundwater remediation would not affect any known or previously undiscovered historic or archaeological resources (Ball 1991).

The removal of contaminated soils and sediment in Operable Unit 5 would not require a large number of workers for implementation and, therefore, would not affect the local labor market. There would also be no anticipated impacts on the local transportation systems as a result of soil and sediment removal. Removing contaminated soils and sediment from their current locations would be perceived by the local residents as beneficial, with reservations concerning potential spills/accidents during the removal process. On-property soil and sediment removal would not affect any known historic or archaeological resources. Archaeological surveys would be performed prior to disturbance and appropriate mitigation

implemented. In the long term, the removal of waste would be beneficial to the local economy because the threat to human health and the environment would be reduced.

Potential impacts resulting from waste treatment vary with the treatment used. Waste treatment processes proposed for Operable Unit 5 would not have an impact to the local economy. The impacts arising from the construction of an on-property disposal facility would be similar to those discussed for Operable Unit 1 (Section G.2.1.2.7).

G.2.5.2.7 Cultural Resources

A site-wide archeological survey would be performed for the areas to be impacted by Operable Unit 5 activities. Any activities to be significant from a cultural resources standpoint would be managed consistently with the requirements of the NHPA, OHPO, AIRFA, and NAGPRA. Because any cultural resources identified would either be avoided or managed appropriately, there would be no impacts to cultural resources at the FEMP site.

G.3.0 CUMULATIVE IMPACTS OF PROPOSED ON-PROPERTY ACTIONS

When describing all the potential impacts arising from remedial activity, it is important to address the possible impacts arising from concurrent implementation of activities. Simultaneous implementation of remediation projects for LRAs at all of the operable units could multiply the impacts resulting from the remediation of a single waste unit or operable unit. Current scheduling indicates that Operable Units 1, 2, 4, and 5 have the potential for concurrent implementation, as do Operable Units 1, 3, and 5 (Figure G.3-1). Added to these possible overlaps are the activities associated with the on-property above ground disposal facility and other site-wide facilities.

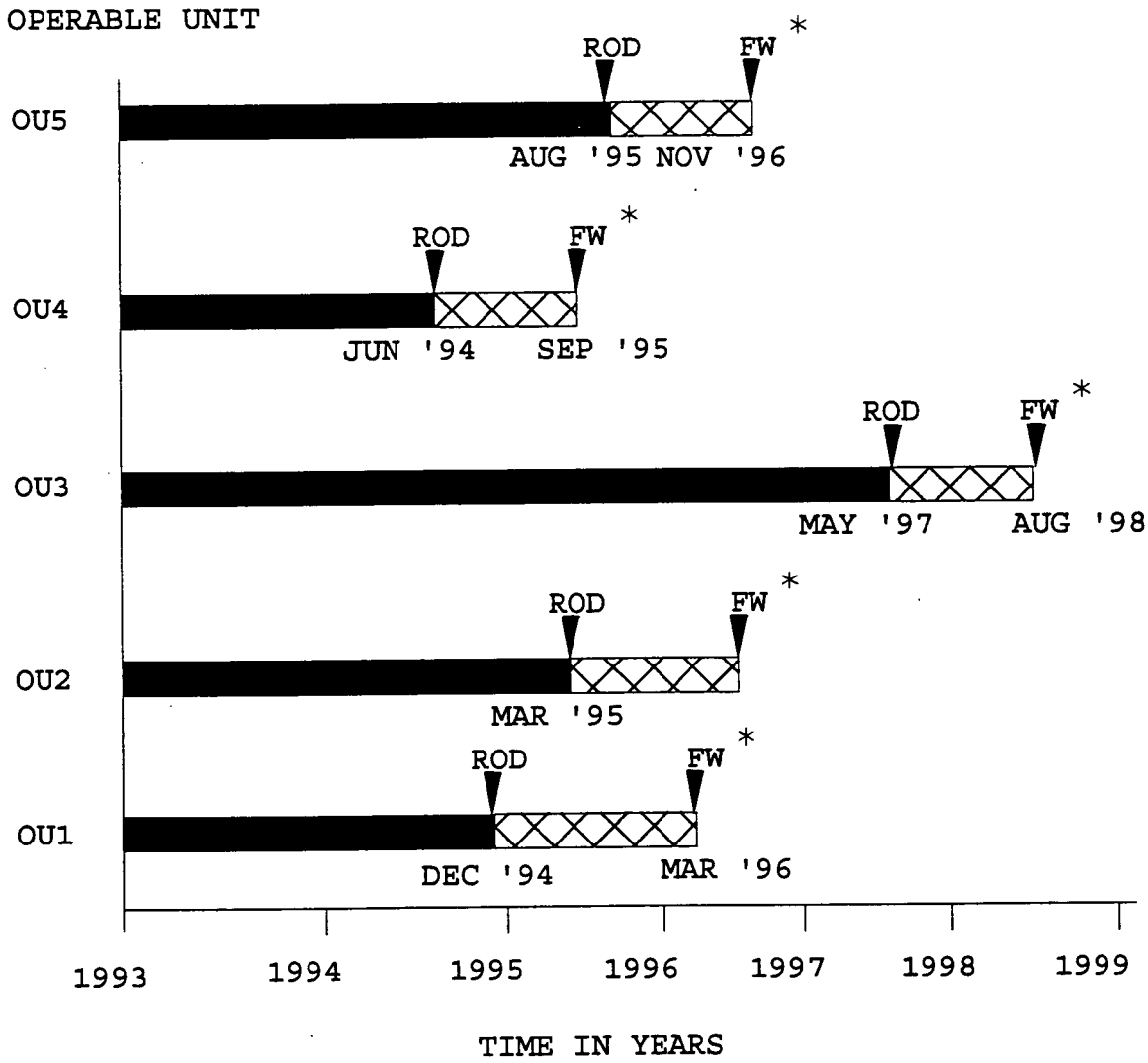
G.3.1 SOIL AND GEOLOGY

The mechanical and/or hydraulic removal of pit wastes, soils, buildings and other structures in the former Production Area poses the greatest short-term threat to subsurface soils. Adverse impacts on subsurface soil could result if there is a breach of a pit liner during the removal process or the release of loose contamination from structures. The breach could act as a conduit which may allow contaminated water and/or waste to migrate into the glacial overburden in higher concentrations and at a faster rate than currently occurs.

If contaminants remain on the ground surface for extended periods of time, infiltration of rainwater or storm water runoff could cause migration of the contaminants into the subsurface soils. Judging from existing conditions, it is unlikely that major impacts on the subsurface soils would occur.

Removal of wastes from Silos 1, 2, and 3 would temporarily disturb approximately 3.16 hectares (8 acres) of soils. These areas would be regraded and returned to their previous condition following remediation. Construction of a disposal facility for the berm soils and silo structures would result in the permanent disturbance of approximately 4.7 hectares (11.6 acres) of soils, 1.0 percent of the land area of the FEMP site. No impacts are anticipated on the regional geology of the area as a result of operable unit remedial activities.

*NOTE: 15 MONTHS FOLLOWING THE ROD, FIELD WORK (FW) MUST BEGIN



SOURCE: AMENDED CONSENT AGREEMENT, 1991

Figure G.3-1 Barchart of Records of Decision

The preferred alternative for Operable Unit 1 would result in the temporary disturbance of approximately 14.0 hectares (36.4 acres) of land due to the excavation of the waste pits and associated soils. However, these areas would be regraded and evaluated to promote positive drainage. Furthermore, the LRA for Operable Unit 1 does not involve on-property disposal, thereby resulting in no long-term impacts to soil and geology.

When the alternatives selected in Operable Units 1, 2, and 4 Proposed Plans are combined with the LRA for Operable Units 3 and 5, it is likely that approximately 81 hectares (200 acres) will be disturbed during remediation, with an additional 61 hectares (150 acres) permanently committed to disposal. In a worst-case approach, all 142 hectares (350 acres) would be permanently lost at the site. This number is slightly lower than previous evaluations due to the disposal of Operable Unit 1 material off site.

Adverse impacts on surface soils could result during waste removal, segregation, and treatment. There is the potential for spills to occur during the handling and packaging of waste as well as during transport to the treatment facility. Spills would be expected to affect only localized areas, and surface soils contaminated by a spill could be excavated and disposed of with the waste material. Therefore, impacts on surface soils from spills would likely be minor.

The removal of contaminated structures from the former Production Area, along with waste treatment and decontamination, should have beneficial long-term effects on both surface and subsurface soils due to the removal of contaminant sources. Pumping and treatment of the contaminated perched and regional groundwater should stop contaminant migration in the subsurface soils.

G.3.2 WATER QUALITY AND GROUNDWATER HYDROLOGY

Adverse impacts to both the perched groundwater and the regional aquifer would not be increased by concurrent remedial activities. The possibility of contaminant migration to the aquifer exists during any remedial activity, whether the activities are performed individually or concurrently. The rate at which contaminants are supplied to the regional aquifer may be increased with concurrent remediation activities, but the overall contaminant load would remain the same. The DOE guideline for uranium

in drinking water is 30 parts per billion or 20 picoCuries per liter. However, EPA has proposed 20 parts per billion (13.5 picoCuries per liter) as a standard for uranium in drinking water which will likely be promulgated. Groundwater monitoring will continue throughout remedial actions and upon completion of remedial actions to ensure that areas exceeding the standards are identified and appropriate response actions are identified.

Long-term groundwater quality may improve as a result of the implementation of the LRAs due to the fact that FEMP site wastes will be eliminated and/or isolated from rainwater and storm water runoff, preventing the potential infiltration of these contaminants to perched groundwater and the regional aquifer. Any hazardous waste disposal facility would comply with the requirements specified in the facility permit for the uppermost aquifer underlying the waste management area beyond the point of compliance. The concentration of chemicals in groundwater should not exceed background levels of the listed maximum concentration of the constituent for groundwater protection, whichever is higher (10 CFR 264.94).

The findings of the Operable Unit 4 CRARE, Appendix K to the Operable Unit 4 FS Report, identified the consumption of drinking water as a major pathway of concern. Groundwater modeling in the CRARE predicted that the highest cancer risk in this pathway would be associated with residual uranium leaching from site-wide soils. However, the carcinogenic risk levels associated with the groundwater pathway under the various land-use scenarios are within the target risk range of 10^{-6} to 10^{-4} in all cases. All remediation of waste with the potential to release radionuclides that are contained in the waste materials to the environmental media would be in compliance with DOE Order 5400.5, Chapter III, "Radiation Protection of the Public and the Environment."

Surface Water. The simultaneous implementation of LRAs has the potential to increase surface water quality impacts over those which would normally be expected from implementation of a single project. Impacts to surface water quality in Paddys Run could result during capping of Operable Unit

2 waste units; during removal, treatment, and on-property disposal of Operable Units 3 and 5 wastes; and during the removal, decontamination, and on-property disposal of Silos 1, 2, and 3 structures, berms, and soils in Operable Unit 4. Short-term impacts resulting from these activities may include contaminated runoff entering Paddys Run; erosion of exposed wastes and the subsequent influx of contaminated soils into the stream during waste removal and capping; an increase stream turbidity resulting from excavation of contaminated sediments; and relocation of portions of the stream. Over the long term, however, surface water quality in Paddys Run may improve due to the fact that FEMP site wastes will be isolated from rainwater and storm water runoff, thus eliminating the potential migration of contaminated material into Paddys Run. No cumulative impacts on the Great Miami River are anticipated from the simultaneous implementation of the LRAs. All effluents produced by the LRAs will be treated to comply with FEMP NPDES permit limits and conditions prior to discharge to the Great Miami River. In addition, all pollutants or combinations of pollutants will be treated so as not to exceed the numerical and narrative criteria for aquatic life habitat and water supply use designations for Paddys Run and the Great Miami River Ohio Administrative Code [(OAC 3745-1-07 and OAC 3745-1-21)].

Cumulative wetland impacts may also arise from the implementation of the LRAs, particularly in the forested wetland in the northern part of the site and the various emergent wetlands associated with site drainage ditches. Wetland impacts most likely will result from the siting of treatment and disposal facilities and from the potential of contaminated runoff during waste removal and construction activities. Proposed DOE actions in these wetlands would first be evaluated for potential adverse effects to the wetlands (10 CFR 1022) and consideration would be given to natural and beneficial values provided by the wetlands when considering mitigation alternatives to offset the impacts. Cumulative impacts to the 100- and 500-year floodplain of Paddys Run could result from the relocation of portions of the stream channel to facilitate capping of contaminated soils within the waste pit area and capping of soils associated with the flyash piles and South Field.

G.3.3 AIR QUALITY

Cumulative air quality impacts will be based on projected emissions from each of the LRAs for operable units at the FEMP site. The emissions of primary short- and long-term concern with respect to ambient air involve the re-entrainment of radiologically contaminated fugitive dust and the volatilization of toxic chemicals.

Remedial alternatives that involve in situ procedures such as capping have little or no impact on ambient air. However, waste removal activities and alternatives that involve substantial waste handling have the potential to generate radiologically contaminated dusts and other waste constituents. These activities include ground clearing, excavation, demolition, cut-and-fill operations, loading/unloading trucks, heavy equipment traffic, and wind erosion of disturbed areas. During periods of turbulent wind conditions, particles of disturbed surface materials (e.g., contaminated soil) can become resuspended in ambient air and be subject to inhalation by on-property and/or off-property receptors. The amount of dust resuspended depends on wind speed and other site conditions such as soil moisture, particle size, and vegetative cover. Resuspended particles are then carried downwind to on- and/or off-property receptors.

Additional potential airborne pollutants associated with remedial activities at the FEMP site include inorganic constituents, volatile organics, semivolatiles, polychlorinated biphenyls (PCBs), dichlorodiphenyl trichloroethane (DDT), herbicides, radionuclides, and radon. Emissions of these pollutants could result from the removal and handling of volatile or semivolatile wastes, waste segregation activities, and vitrification processes.

In the past, radon has been a significant portion of the annual dose to the public adjacent to the FEMP site. Until remedial activities are complete, DOE Order 5400.5 regulates radon concentrations in the atmosphere above facility surfaces or openings at and adjacent to the FEMP. When added to background levels, the concentrations mandated by DOE Order 5400.5 must not exceed an annual

average concentration of 30 picoCuries per liter over the FEMP and 3 picoCuries per liter at or above any location outside the FEMP property. Once remedial activities have been completed, the National Emissions Standard for Hazardous Air Pollutants (NESHAP) Subpart Q standard (40 CFR 61 Subpart Q) of 20 picoCuries per square meter per second for radon-222 will be applied to site storage and disposal areas for radon producing wastes. An active monitoring system has been in place at the FEMP site since the early 1980s. As a point of comparison, the average site boundary total radon concentration of 0.57 picoCuries per liter in 1992 was about 29 percent of the average indoor radon concentration (2.0 picoCuries per liter) for homes in the Cincinnati area. Monitoring will continue throughout the remedial activities and upon completion of remedial activities (as appropriate) to ensure that radon levels remain in compliance with all applicable regulations.

Guidelines for concentrations of radionuclides other than radon-222 are also established by DOE Order 5400.5. These concentrations, referred to as Derived Concentration Guidelines (DCGs), are concentrations of radionuclides that, under conditions of continuous exposure for one year by one exposure mode, would result in a dose of 100 millirem. In addition to the DCGs, radiologic emissions to the ambient air from the FEMP site will also be subject to the NESHAP Subpart H standard (40 CFR Part 61 Subpart H), which stipulates that radiological emissions from the site can not exceed those amounts that might cause any member of the public to receive an annual effective dose equivalent (EDE) of 10 millirem per year. Monitoring of the air pathway for radionuclides during the FEMP site remedial activities will continue to ensure that emission levels do not exceed applicable DCGs or the NESHAP Subpart H standard.

The impacts associated with the generation of fugitive dust and the volatilization of toxic chemicals tend to be short term. Cumulative air quality impacts that would occur during phases of remedial activity at the FEMP site would include pollutants generated off property as well as those generated on property. Though there are no major sources of pollutants in the vicinity of the FEMP site, there would be substantial amounts of transportation-related pollutants generated off property by the large

number of trucks necessary to supply construction materials for the disposal facility (described in detail in Section G.2.2.2.7). In addition to pollutants generated on property by disposal facility construction, filling, and closure, the cumulative air quality impact would also depend on: (1) the remedial alternatives chosen; (2) the remediation schedule (e.g., the extent of simultaneous remedial activities across the FEMP site); (3) the mitigating measures or controls chosen; and (4) their effectiveness. Typical control methods for various remedial activities and qualitative evaluations of their effectiveness, advantages, and disadvantages are included in the Operable Unit 4 FS Report, Appendix G, Attachment I.I, Table G.I-3.

The potential for long-term residual risks associated with the FEMP site in a post remediation condition has been evaluated in the Operable Unit 4 FS Report, Appendix K. The findings of the CRARE identified the inhalation of dusts as a major pathway of concern with respect to long-term cancer risks. The primary source of radionuclide emissions are from site-wide soils remaining in Operable Unit 5. However, the carcinogenic risks associated with a 70-year lifetime exposure for the various land-use scenarios were calculated to be within the target range of 10^{-6} to 10^{-4} (one cancer risk per one million people to one cancer risk in 10,000 people) in almost all non-resident cases. Only the land-use scenario involving on-property residential farmer receptors gave risks above the 10^{-4} level. Emissions of radionuclides to the ambient air from the FEMP site would not exceed those amounts that might cause any member of the public to receive an EDE of 10 mrem per year in any year.

Monitoring would be implemented at release points having potential to discharge radionuclides that could cause an EDE in excess of 0.1 mrem/year to any member of the public (40 CFR 61, Subpart H).

G.3.4 BIOTIC RESOURCES VEGETATION

Cumulative impacts on vegetation could result from short- and long-term removal and disturbance of habitat associated with capping of Operable Unit 1 contaminated soils and Operable Unit 2 waste

units: construction of staging areas, support facilities, and the disposal facility; and general physical disturbance of soils. The capping of Operable Unit 2 waste areas would result in the removal of between 8 and 10 hectares (20 and 25 acres) of introduced grassland and successional and riparian woodland habitats. Construction of an on-property disposal facility to dispose of wastes from Operable Units 2, 3, 4, and 5 would result in the permanent loss of approximately 61 hectares (150 acres) of habitat. Construction of an interim storage facility would have a similar impact, although restoration may be possible once wastes are removed from the FEMP site. In the long term, the cumulative impacts of FEMP site remedial activities will be beneficial due to the prevention of releases of contaminants into the environment.

Wildlife. Concurrent implementation of remediation activities could have impacts on wildlife primarily through the short- and long-term removal and disturbance of habitat as described above, with correlated reductions in local wildlife populations. Cumulative impacts on wildlife would differ from the impacts of these same LRAs considered separately. For example, if remedial activity were spread out over time, adjacent undisturbed areas could provide refuges for displaced wildlife. These "safe" areas would not be available if activities are simultaneous. Cumulative project-related noise and increased levels of human activity could disrupt nearby wildlife to a greater degree than individual actions and would reduce or eliminate wildlife use in most areas of the FEMP site.

Capping of contaminated Operable Unit 2 waste units would require realigning portions of Paddys Run, resulting in the fragmentation of the riparian corridor along the stream. In the long term, the cumulative impacts of FEMP site remedial activities would be beneficial due to the prevention of releases of contaminants into the environment.

Aquatic Ecology. Cumulative impacts on aquatic organisms from remedial actions involve the potential contamination of Paddys Run, the Great Miami River, and various drainageways and floodplains in wetland areas. Potentially affected aquatic organisms include fish, invertebrates,

amphibians, reptiles, and semi-aquatic species such as muskrats. Acute or chronic exposure of aquatic species to toxic contaminants and radionuclides may result in the local reduction or extinction of a particular species population, or severely reduce reproductive efficiency. Additionally, physical impacts on aquatic habitat resulting from remedial activities would adversely affect aquatic populations. Loss of habitat or contaminant exposure could also lead to a reduction in species biodiversity.

Levels of contaminants could increase to potentially toxic concentrations in Paddys Run and wetland drainage areas from soil erosion and runoff during concurrent waste removal, stabilization, and isolation activities for Operable Units 1, 2 and 5. Additionally, destruction of aquatic habitat in these areas from capping of waste areas in Operable Unit 2 and the excavation of contaminated sediments for Operable Unit 5 would adversely affect organisms residing in this area. Small affected areas in Paddys Run and the wetland drainages resulting from isolated remedial actions would probably recover quickly, but recovery from simultaneous impacts over a larger area would likely require a much longer time to restabilize. Adverse cumulative impacts on aquatic organisms could be substantially mitigated by diversion and collection of runoff and by performing removal activities when flow in Paddys Run and the Storm Sewer Outfall Ditch is low or nonexistent. The simultaneous removal and treatment of wastes from the Operable Unit 3 former Production Area and remedial activity for Operable Units 1 and 5 would not substantially contribute to the impacts on aquatic organisms.

Waste removal, stabilization, and isolation activities for Operable Units 2 and 5 could result in short-term adverse effects on aquatic species associated with the Great Miami River from contaminant exposure and increased turbidity. These impacts would not likely result in long-term adverse effects, given the large dilution factor.

Waste removal, stabilization, and isolation activities conducted for Operable Unit 1 and the Solid Waste Landfill in Operable Unit 2, combined with the concurrent citing of an on-site storage facility or a disposal facility in this area of the site, would likely result in short-term adverse cumulative impacts on the organisms in the wetland drainages in this area. Long-term, negative effects on aquatic organisms could be minimized if the areas were revegetated after completion of the activities. Of particular concern is the 20-hectare (50-acre) tract of forested wetlands in the northern portion of the FEMP site. The cumulative effects would be beneficial in the long term by reducing or eliminating exposure to wastes.

Threatened and Endangered Species. Cumulative impacts on threatened and endangered species include the potential loss of habitat, disruption of breeding activities, and loss of individuals. In the event that the riparian corridor along Paddys Run is fragmented, potential Indiana bat (*Myotis sodalis*) habitat, classified as fair to good, could be lost. The state-listed endangered slender finger-grass (*Digitaria filiformis*) and mountain bindweed (*Polygonum cilinode*) have been observed in this corridor and could also be adversely affected. The relocation of portions of Paddys Run due to capping of Operable Unit 2 waste units could have short-term adverse impacts on Sloan's crayfish (*Orconectes sloanii*), a state-listed threatened species that has been observed in Paddys Run. In the long term, the cumulative impacts of FEMP site remedial activities will be beneficial due to the prevention of releases of contaminants into the environment.

G.3.5 WETLANDS AND FLOODPLAINS

A site-wide delineation was conducted in February 1993 in accordance with the 1987 Army Corps of Engineers Wetlands Delineation Manual and approved on August 12, 1993. The purpose of the delineation was to determine the extent of jurisdictional wetlands and waters of the United States at the FEMP site and to avoid or minimize impacts to these resources during future activities. A jurisdictional determination has been approved by the COE which establishes jurisdictional wetlands boundaries and waters of the United States. Results from the site-wide delineation indicate a total of

14.5 hectares (35.9 acres) of jurisdictional wetlands on the FEMP site. Wetland impacts as a result of operable unit remedial activities would be minimized by implementing best management practices during and following remediation. Proper notification and mitigative measures would be executed if impacts are expected to occur.

Floodplains within the FEMP property are confined to the north-south corridor containing Paddys Run. Outside the boundaries of the FEMP, the 100- and 500-year floodplain of the Great Miami River extends west of the Big Bend to an elevation near the eastern boundary of the facility. The 100- and 500-year floodplain of the river also extends northward along Paddys Run from the confluence of the two streams to a point north of the northern boundary of the FEMP. During remediation, some impact to the 100-year and 500-year floodplain may occur due to excavation activities. In extreme cases, the relocation of Paddys Run and the floodplain may be necessary. During remedial action, engineering controls (e.g., silt fences and berms) will be utilized to minimize floodplain impacts. In cases where relocation is required, the floodplain will be re-established to near original condition.

G.3.6 SOCIOECONOMICS AND LAND USE

Simultaneous implementation of remediation projects for all of the operable units could multiply the impacts resulting from the remediation of a single waste unit or operable unit. Operable Units 1, 2, 4, and 5 have the potential for concurrent implementation as do Operable Units 1, 3, and 5. The following is a discussion of potential impacts of concurrent remedial activity at the FEMP site on the local economy, land use, transportation systems, community services, and cultural resources.

Economic Activity. The maximum number of workers that would be required for implementation of LRAs for each operable unit is expected to be small. Although the scope of work may be large, the work is usually expected to be completed by multiple small crews working over a long period of time. For example, the labor force required to construct the on-property disposal facility is an

estimated maximum of 155 persons per day over the 20-year life span of the project. More specific impacts on the local economy will be estimated as detailed cost estimates are made and will be reported in subsequent operable unit feasibility studies.

Total employment at the FEMP site is expected to remain constant during the implementation of remedial activities. Existing on-site workers will be utilized to the maximum extent possible. However, it is expected that specialized personnel will be brought in during remedial activities for required additional skills. Overall levels of employment at the FEMP site are expected to decline as removal and remedial activities are completed.

One sector of the local economy that would experience direct impacts resulting from remedial activity at the FEMP site would be wholesale and retail sales, with particular emphasis on the provision of construction materials such as concrete, aggregate, and lumber. These impacts would be most felt with the initiation of capping and on-property disposal or storage alternatives. For example, construction material requirements for the disposal facility are substantial (Parsons 1992). Total materials estimated to be required for construction of the vaults include 409,419 cubic meters [535,500 cubic yards] of concrete, 96,615 metric tons (106,500 tons) of reinforcing steel, and 1,070,377 cubic meters (1.4 million cubic yards) of site work, which includes backfill with concrete foundation work. This is in addition to an estimated 2,140,754 cubic meters (2.8 million cubic yards) of earth fill and over 1,529,110 cubic meters (2 million cubic yards) of stone that would be required to be imported to the site to complete earthworks for the structures. Also required would be approximately 209,032 square meters (250,000 square yards) of aggregate, 45,150 square meters (54,000 square yards) of asphalt, and 4682 square meters (5600 square yards) of concrete for roads and aprons used during construction, filling, and monitoring. Although current construction schedules indicate that these materials would be used and purchased over several years (a total of 20 years in the case of the disposal facility), the impacts to local and regional suppliers as well as

consumers may be felt as local supplies dwindle, additional materials are imported, and prices rise. Indirect impacts to employment in these sectors would also be likely.

Land Use. A number of acres that contain prime farmland soils are located within the boundaries of the FEMP site. The construction of an on-property storage or disposal facility would result in an irretrievable loss of some of this soil. Capping alternatives may also encroach on some of these designated soils. The proposed removal of contaminated soils under Operable Unit 5 may also result in loss of prime farmland soil, although the fact that the soils are contaminated means they are already no longer considered prime.

Transportation. Impacts to local transportation systems arising from concurrent implementation of LRAs would include transporting large amounts of materials to the site [up to 704,567 metric tons (776,652 tons)] for Operable Unit 2 alone combined with the disposal facility materials described in Section G.3.7.1, and a potential for enough trips per day to and from the site to require consultation with the local Ohio Department of Transportation representative to discuss potential damage to State Route 128. This will be required with the potential addition of more than 1000 one-way trips a day over any given period of time. The maximum total of one-way trips resulting from the implementation of Operable Unit 2 remediation alternatives alone is 552. Combined with the transport estimated for construction of the disposal facility (as described in detail in Section G.2.2.2.7), the number rises (by 432) to a maximum of 984. Because concurrent construction is likely, the total number of one-way daily truck trips during FEMP site remediation will require consultation with local officials. More specific impacts to the local roads will be estimated as detailed cost estimates are calculated and will be reported in subsequent operable unit feasibility studies.

Additional transportation impacts from remediation include the transport of materials on the property. Maximum impacts would arise from implementation of all of the waste removal and treatment alternatives. For Operable Unit 2, there could be a total of more than 18,500 trips from each waste

unit to the treatment facility and the same number of return trips over the duration of the activity. On-property disposal increases these trips by approximately 43,900 each way to transport wastes to the disposal facility from the treatment facility. This would be combined with a total of 1.2 million one-way truck trips for concurrent construction and closure of the disposal facility as well as additional activities related to one or more other operable units. Traffic control measures will be required. However, vehicle exhaust could result in minor impacts to air quality. More specific impacts to on-property transportation systems will be estimated as detailed cost estimates are calculated and will be reported in subsequent operable unit feasibility studies.

Impacts from Current Off-Property Waste Transport

DOE-Fernald has two categorical exclusions in place concerning the transport of waste off site: "FEMP Site Waste and Hazardous Material Shipping" (FEMP site NEPA Document No. 387) and "Shipment of Thorium Low-Level Waste" (FEMP site NEPA Document No. 349). The first document describes the shipment of various types of waste, hazardous materials, and laboratory and treatability samples from the FEMP site to various licensed disposal facilities, laboratories, and other federal facilities, as well as the reverse. Included is a variety of wastes classified as RCRA hazardous wastes, mixed waste, low-level waste (LLW), and PCB-contaminated waste currently stored on site and awaiting final disposal. In addition, past production operations resulted in the generation of a variety of other hazardous materials [e.g., low-level residues, high grade residues, orange oxide (UO_3), green salt (UF_4), uranium derbies, and refinery feedstock currently awaiting final disposition]. Facilities that are to receive and ship the waste, hazardous materials, and samples include, but are not limited to, the following: privately owned, licensed treatment and disposal facilities; privately owned laboratories; privately owned nuclear facilities; and federal facilities [e.g., DOE sites, and the Department of Defense (DOD) Consolidation Facility].

Transport of wastes involves the packaging and shipping of existing wastes, hazardous materials, and samples that have been and will be generated from FEMP site removal actions and routine

maintenance projects. Samples that are sent to laboratories for characterization and treatability studies are shipped back to the FEMP site for storage and final disposal. In some cases, it may also be necessary to ship waste and hazardous materials back to the FEMP site if the material is not accepted at the disposal facilities. All material received at the FEMP site will be in compliance with approved FEMP site acceptance criteria for the receipt of sample and waste material.

Several FEMP site removal actions involve the disposition of currently stored waste and hazardous material inventories (e.g., Removal Action 9 - Removal of Waste Inventories, Removal Action 12 - Safe Shutdown, and Removal Action 15 - Scrap Metal Piles). These removal actions require the packaging and shipping of LLW and other hazardous materials that are currently stored on site. LLW material will be shipped to other facilities for treatment and disposal. Hazardous nuclear materials generated will be shipped to other federal facilities or their contractors' facilities for use and/or storage.

In addition, a number of proposed removal actions would generate LLW materials, RCRA hazardous waste, and mixed waste (e.g., Removal Action 13 - Plant 1 Ore Silos and Removal Action 24 - Pilot Plant Sump). The LLW will be packaged and shipped for disposal under Removal Action 9. RCRA hazardous waste and mixed waste will be packaged and stored on site in approved RCRA storage areas until they are shipped for disposal as a routine maintenance activity.

Other sources of waste and hazardous material shipped from the FEMP site will be routine maintenance activities (e.g., activities required to maintain and preserve buildings, structures, and equipment). Stored inventories of RCRA hazardous waste, mixed waste, and PCB-contaminated waste will be packaged and shipped for treatment and disposal under regulations addressing routine maintenance activity. Ongoing FEMP site routine maintenance activities will result in the generation of additional quantities of these wastes that will also be shipped off site for treatment and disposal.

Routine maintenance activities will result in the generation of additional quantities of LLW that will be handled under Removal Action 9.

DOE proposed to ship 13,000 containers of thorium LLW to the NTS for final disposal. These 13,000 containers of thorium LLW are being overpacked in Department of Transportation (DOT) approved containers. The thorium is being shipped from the FEMP site to the NTS for final disposal.

The thorium shipments will occur over a period of three years, at a rate of approximately 175 shipments per year. Total LLW shipments from the FEMP site will be approximately 1600 per year. The remaining 1425 annual shipments will consist of uranium LLW.

The transport of thorium is considered a removal action and is conducted in accordance with the requirements of RCRA and CERCLA. All waste transported from the FEMP site is shipped in accordance with DOT requirements. This thorium transport is consistent with the CERCLA Consent Agreement between DOE and EPA, and helps ensure an efficient response action.

An EA was prepared in May 1985 for the proposed LLW processing and shipment system at the FEMP site. The wastes addressed in the EA were those contaminated with low levels of radioactivity resulting from the production of uranium metal. A Finding of No Significant Impact (FONSI) was issued in June 1985. A Memorandum to File (MTF), prepared in August 1987, concluded that an increase in shipments of waste would not have significant environmental effects. The MTF was supplemented in August 1989 to address the overpack and shipment of the 13,000 containers of thorium waste; the MTF supplement was provided to DOE-Headquarters, Office of NEPA Oversight. On February 21, 1991, a categorical exclusion for the overpacking and storage of the 13,000 containers of thorium was signed by the Manager of the DOE Field Office, Oak Ridge. Upon review, the Office of NEPA Oversight had no objection.

The FEMP site categorical exclusion determinations for both transport activities was written pursuant to the Amendments to Section D of DOE's NEPA Guidelines, published in the Federal Register on September 7, 1990, which adds classes of actions generally applicable to all DOE actions that normally do not require EAs or EISs. These guidelines were updated and published on April 24, 1992, and the categorical exclusion is still appropriate. The proposed action was determined not to violate applicable statutory, regulatory, or permit requirements; it will not require citing and construction or major expansion of waste disposal, recovery, or treatment facilities; and it will not impact any environmentally sensitive areas (e.g., wetlands, floodplains, or the sole-source aquifer underlying the site).

Community Services. Community services that could be affected by remedial activities include schools, health care facilities, housing, emergency and protective services, and water and wastewater treatment systems. Impacts to these services normally arise primarily as a result of a relocation of large numbers of workers during major activities such as the remediation. Because the employment requirements for FEMP site remediation are not expected to result in a major influx of workers during remedial activity, due in part to the work being spread over time, no long-term impacts on these services are anticipated.

G.3.7 CULTURAL RESOURCES

Any federal activity that may adversely affect a site or structure that is listed in the NRHP, or is considered eligible for inclusion in the NRHP must undergo rigorous scrutiny to ensure that the adverse effect is avoided. This examination is also necessary to determine potentially significant sites such as uncovered archaeological remains. The Ohio State Historic Preservation Officer has stated that remedial activity within the boundaries of Operable Unit 3 would not adversely affect any properties listed on or eligible for the NRHP (Luce 1987). To ensure that no resources will be affected by remedial activities in the other operable units, an archaeological survey of the property would be performed. As previously mentioned, the rainbow arch bridge over Paddys Run on Willey

Road may be affected by transport of materials to the FEMP site. The OHPO and the Ohio DOT should be contacted for consultation. Any additional construction proposed beyond the boundaries of the FEMP site would require an archaeological survey and consultation with state and national preservation officials prior to initiation.

G.4.0 AGENCIES CONSULTED AND RELATIONSHIP TO OBJECTIVES OF LOCAL, STATE, REGIONAL, AND FEDERAL LAND USE PLANS, POLICIES, AND CONTROLS

During the development of the level FS/PP-EIS for Operable Unit 4, a number of federal, regional, state, and local organizations were contacted for information or assistance. This information has been referenced herein for the Operable Unit 1 FS/PP-NEPA evaluation. Some of these agencies were also contacted for consultation under 40 CFR 1502.16, which requires a discussion of "possible conflicts with the objectives of state, federal, regional, and local land use plans, policies, and controls" in environmental documents. Agencies were contacted under this provision to determine whether any conflicts would arise as a result of remedial activity at the FEMP site. No agency or organization that was contacted considered future remedial actions at the FEMP site to be in conflict with its land use plans, policies, or controls in the area. The following organizations were contacted:

Federal:

- U.S. Environmental Protection Agency
- U.S. Department of the Interior
- U.S. Department of Transportation
- Bureau of Land Management
- U.S. Fish and Wildlife Service

State:

- Ohio Environmental Protection Agency
- Ohio Department of Natural Resources, Wildlife Division
- Ohio Department of Transportation
- Ohio Department of Natural Resources, Division of Natural Areas and Preserves, Parks Department
  - Soil Conservation Service
  - Ohio Historic Preservation Office
  - Ohio Department of Commerce, Data Users Center
  - Ohio Department of Rehabilitation and Correction
- US Army Corps of Engineers, Louisville, KY District

County:

- Hamilton County Planning Commission
- Hamilton County Park District
- Hamilton County Engineer
- Hamilton County Cooperative Extension Service

- Butler County Planning Commission
- Butler County Park District
- Butler County Engineer
- Butler County Cooperative Extension Service
- Butler County Treasury Office
- Hamilton County Treasury Office
- Warren County Auditors Office
- Clermont County Accounting Office
- Brown County Auditors Office
- Boone County (Kentucky) Auditors Office
- Gallatin County (Kentucky) Auditors Office
- Kenton County (Kentucky) Treasury Office
- Grant County (Kentucky) Treasury Office
- Campbell County (Kentucky) Payroll Office
- Pendleton County (Kentucky) Auditors Office
- Dearborn County (Indiana) Auditors Office
- Ohio County (Indiana) Treasury Office

Regional:

- Ohio-Kentucky-Indiana Regional Council of Governments (OKI) - A regional planning agency involved in a variety of areas including water resources, solid waste management, population studies, public services management, transportation, and land use in the Greater Cincinnati area.
- Ohio River Valley Sanitation Commission (ORSANCO) - A group responsible for monitoring and reporting the water quality of the Ohio River and its major tributaries.
- Water Management Association of Ohio - An organization dedicated to supporting the development, conservation, control, protection, and use of Ohio's water resources for beneficial purposes.
- Miami Conservancy District - A water conservation subdistrict responsible for the observation and evaluation of water resources in the area between Hamilton and New Baltimore.
- Miami Purchase Association for Historic Preservation

Local:

- Hillside Trust - A nonprofit organization dedicated to promoting the preservation and thoughtful use of the hillsides in the Greater Cincinnati area.
- Hamilton County Prisons
- Great Rivers Council, Girl Scouts of America
- Ross Township Trustees

- Crosby Township Trustees
- Fernald Citizens Task Force - a FEMP site-specific advisory board to make recommendations on strategic issues such as future use of the site, waste disposition, and cleanup objectives and priorities.

G.5.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The implementation of the LRAs and preferred alternatives, as appropriate for Operable Units 1, 2, 3, 4, and 5 will result in the commitment of land, economic resources, and regional raw materials. The alternatives will require a commitment to retain most of the wastes on property. The development of treatment facilities and a waste disposal facility (above-grade disposal facility) at the FEMP site will reduce the flexibility for future waste management decisions by the actions of the DOE. These alternatives could result in the restricted use of the land for thousands of years. The commitment of raw materials, economic resources, and some land is unavoidable for any alternative at the FEMP site. The irretrievable commitment to the site as a permanent waste facility needs to be examined carefully in terms of DOE's future policies in the waste management program.

The following paragraphs will analyze these commitments, using information available at this time. Alternatives for Operable Units 2, 3, and 5 are in preliminary planning stages, and the total resources required for remedial alternatives are not developed. Therefore, the cumulative commitment of resources cannot be completely quantified at this time. Subsequent FS reports will update and expand the analysis presented in Operable Unit 4 and Operable Unit 1. The purpose of the evaluation of resource commitment is to outline the major issues and tradeoffs to be considered in the final selection of remedial and waste management alternatives for the FEMP site. This analysis complies with NEPA guidelines for EIS preparation.

Each remedial alternative will require some commitment of land, economic resources, and regional raw materials. The alternatives that require excavation, on-property treatment, and on-property disposal will require the highest commitment of land, economic resources, and regional raw materials. At least 21 hectares (200 acres) of land would be disturbed during remediation operations. For Operable Units 1, 3, 4, and 5, waste would be removed and treated. For Operable Unit 2, caps would be constructed over the waste units. The waste that is removed will be placed in a disposal facility on property. This facility will require an additional 81 hectares (200 acres) of land on a 425-hectares (1,050-acre) site.

In a possible worst case approach, all 162 hectares (400 acres) would be irretrievable and committed to the DOE Waste Management Program and DOE ownership. The remaining 283

hectares (700 acres) of site property could be made available for private ownership, if not required as a buffer zone adjacent to the waste facility.

As part of the commitment of land at the FEMP, the subsequent loss of various types of habitat will likely occur. It is likely that a portion of the acreage committed to on-property disposal will be in the form of wetlands, terrestrial habitat, and riparian habitat. Assuming the on-property disposal facilities are constructed in the EWMF study area, the entire 10.6 hectares (26.58 acre) of palustrine forested wetlands in the northern part of the site would be lost.

The commitment to a permanent waste facility at the FEMP site will require substantial economic resources. An evaluation of DOE's economic commitment required at all sites is beyond the scope of this report but will be examined in the Programmatic EIS on Environmental Restoration and Waste Management.

Regional raw materials such as concrete, aggregate, and lumber will be required for all remediation alternatives. The largest amounts will be for treatment and disposal facilities. The total amount required is not known at this time. It is possible that the amounts required could cause some temporary regional shortages of construction materials.

If the FEMP site is to remain a permanent waste facility and part of the DOE Waste Management program, there will be a commitment to retain most of the wastes stored on property in a stabilized form. Some of the FEMP site will not be returned to its original agricultural condition. The facility will be monitored and the land will be controlled for an indefinite period of time.

G.6.0 RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM PRODUCTIVITY

During implementation of remedial alternatives for Operable Units 1, 2, 3, 4, and 5, terrestrial and aquatic habitats and species will be disturbed or lost in many areas on, or adjacent to, the site. The natural productivity of the land will be disrupted during remedial operations. At the same time, the productivity of the site labor force and regional raw materials will be high, as facilities are constructed and used for remediation. The long-term monitoring of the FEMP site as a waste facility will provide low productivity in terms of labor force and raw materials. No products will be produced on the land and no tax base will be established for local governments. However, many terrestrial and aquatic habitats and species will re-establish with active mitigation measures and could develop a valuable regional ecosystem resource.

As described in Section G.5, approximately 81 hectares (200 acres) of land would be disturbed during remediation operations, and at least 81 hectares (200 acres) of land and associated habitats will be lost in the location selected for the permanent waste disposal facility. The environmental productivity of the site will be disrupted in the short term, and there is the potential for disruption of a species on the federal or state list of threatened or endangered species. Species that may be present are listed in Table G.2-3 and potential impacts are described in Sections G.2 and G.3. In the short term, the economic productivity on property will be high. Specific data on material requirements and labor force needs are not available at this time. However, it is anticipated that expenditures for labor and materials will continue for the next ten years of remediation operations.

Long-term economic productivity at the facility will be at a much lower level. A limited labor force will be required to monitor the waste facility. Some of the land not required for the waste facility may be available for recreation, agricultural, or other designated uses. The existence of a visible waste facility may slow the economic growth and development of adjacent land. The land occupied by the waste facility will not be productive and will be owned by the DOE. The long-term productivity of terrestrial and aquatic species could be reestablished on the vacant land with active mitigation resources. A valuable, regional ecosystem resource could be developed with wetland and other habitats for threatened and endangered species.

REFERENCES

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ATTACHMENT G.I
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ATTACHMENT G.I LIST OF CONTRIBUTORS

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ATTACHMENT G.II

FEMP SITE REMOVAL ACTIONS CONTINUING, COMPLETED, OR PROPOSED

ATTACHMENT G.II
FEMP SITE REMOVAL ACTIONS CONTINUING, COMPLETED, OR PROPOSED

- Waste Pit Area Runoff Control: This action, completed on July 30, 1992, provided a system for the collection and treatment of potentially contaminated storm water runoff from the Waste Pit Area to prevent it from reaching Paddys Run. The system is operational.

- Silos 1 and 2: This action, completed in November 1991, consisted of installation of bentonite clay over radium-bearing radioactive waste materials in Silos 1 and 2. This removal action accomplished the objectives of substantially reducing the accumulation of radon in the silo headspace and its consequent release to the environment and of providing protection from potential releases to the environment in the event of a silo dome collapse.

- K-65 Decant Sump Tank: The K-65 Decant Sump Tank was used to collect and store the liquid that drained from the K-65 silos as slurried material in the silos settled. The purpose of the removal action, completed in April 1991, was to reduce the potential for contaminated water in the tank to leak into surrounding soils. Approximately 30 cubic meters (8,000 gallons) of water were removed, analyzed, and treated through existing waste water treatment systems at the FEMP site before discharge to the Great Miami River.

- Waste Pit 6 Residues: The purpose of this action, completed in December 1990, was to eliminate the potential for airborne emissions due to wind and erosion from dried residues in Waste Pit 6. A mound of approximately 446 square meters (4800 square feet) of dried radioactive waste, including process residues, asbestos, depleted slag, green salt, and filter cake, was submerged below the water line and distributed evenly below the surface.

- Inactive Flyash Pile Control: The purpose of this action, completed in December 1991, was to prevent unauthorized access to the radiological surface contamination area in the Inactive Flyash Pile. Warning signs were posted and a chain barrier was installed around the perimeter of the Inactive Flyash Pile/South Field areas to minimize potential risk to human health.

- Active Flyash Pile Controls: The purpose of this action, completed in June 1992, was to mitigate potential wind and water erosion at the Active Flyash Pile. Minor grading and compaction were conducted, a silt fence was installed around the base of the pile, wind barriers were erected, and a chemical spray was applied to the surface of the flyash pile to mitigate wind erosion and provide surface stabilization. A large portion of the pile is now inactive and will not receive new ash deposits. The potential use of flyash as an additive to soil for use in backfill, structural fill, and slope stability applications is being investigated.

- Pit 5 Experimental Treatment Facility (ETF): The purpose of this action, completed in March 1992, was to reduce the spread of contamination and exposure of personnel to ETF wastes. The vegetation surrounding the ETF was removed and disposed; waste material in the ETF, the filter bed, and wooden ETF structure were stored in containers; and the soil affected by the ETF was sampled and analyzed.

- Contaminated Soils Adjacent to Sewage Treatment Plant Incinerator: To prevent any potential contaminant migration, this action involved the characterization, removal, containerization, storage, and disposal of soils with elevated uranium levels in the vicinity of an out-of-service solid waste incinerator at the sewage treatment plant. Excavation of contaminated soils and post-excavation sampling activities were completed on October 16, 1992.

- Collect Uncontrolled Production Area Runoff (Northeast): The purpose of this action, scheduled for completion in August 1993, is to collect storm water runoff from perimeter areas of the 55 hectares (136-acre) former Production Area which are not presently draining into the Storm Water Retention Basins.

- Control Exposed Material in Pit 5: To eliminate the possibility of airborne contamination from exposed materials in the pit, the exposed waste materials in the pit were repositioned by dredging to provide for a continuous water cover over the residues. Action was completed in December 1992.

- Stabilization of Uranyl Nitrate Inventories: This removal action, scheduled to be completed in Spring 1993, is designed to process uranyl nitrate inventories at the FEMP site to a stable form which can be drummed and stored in warehouses pending final disposition. Uranyl nitrate is an intermediate product in the former uranium recovery process at the FEMP site. There are approximately 871 cubic meters (230,000 gallons) of acidic uranyl nitrate stored in 21 tanks in or near the Plant 2/3 refinery. A 1991 inspection of the tanks revealed that small leaks had developed in the piping system associated with the tanks.

- Expedited Silo 3 Dust Collector: This action, completed in January 1992, was designed to eliminate the potential for release of radioactive material to the environment from the Silo 3 dust collector and hopper assembly. The three-piece assembly was removed from the top of the silo dome and lowered directly into a sea/land container for disposal. Piping and associated equipment originally used to place waste in the silo were also removed and prepared for shipment. All pathways into the silo were permanently sealed to prevent any release of contents to the atmosphere.

- Waste Pit Area Containment Improvement: This action is designed to minimize the potential for wind or water erosion of contaminated materials from access roads and exposed surfaces in the Operable Unit 1 area. The activities proposed include revegetation of the pit area for erosion control and regrading of some existing storm water ditches in the area to promote positive drainage. A work plan for this action was submitted to the EPA on August 31, 1992 and disapproved October 5, 1992, pending incorporation of comments. Based on an agreement among DOE, EPA and the Ohio Environmental Protection Agency (OEPA), DOE started the revegetation of exposed areas on October 20, 1992. The revised work plan was submitted to EPA in November 1992. (The action was completed in June 1993.)

- Inactive Flyash Pile: This action, completed in June 1992, involved the removal small amounts of radiological surface contamination (contaminated soil and transite) from the Inactive Flyash Pile. The material was stored in appropriate containers pending final disposition. Subsequent radiological monitoring of the flyash pile determined that no additional action is required until the ROD is issued for Operable Unit 2.

- Inactive Flyash Pile: The purpose of this action, completed in August 1993, was to install a long-term erosion control measure for the east bank of Paddys Run at the Inactive Flyash Pile. The action consisted of rock being added to the berm, constructed during Phase I of the Time Critical Removal Action performed in April and May of 1993, which increased the nominal height of the berm three feet to elevation 540 feet near sea level in critical areas. The added weight of the rock increased the forces resisting any slope failure and provided more stability. This rock also covered the exposed vertical soil face above Elevation 537 feet near sea level to minimize erosion during high water levels. Stones were also placed along the toe of the berm in order to achieve a tumble down effect of stone in to any eroded areas created by the stream at the base of the berm.

REMOVAL ACTIONS PLANNED OR CONTINUING

- Contaminated Water Beneath FEMP Site Buildings: The purpose of this removal action, expected to continue through March 30, 1994, is to minimize the potential for uranium-contaminated groundwater in perched zones beneath some former production buildings to infiltrate the underlying aquifer. Perched water zones containing contaminants at levels of concern have been identified in the former Production Area beneath Plants 6, 2/3, 8, and 9. A series of wells has been installed to extract the contaminated water. The water is pumped to a treatment system at Plant 8 to remove any volatile organic compounds and is then processed through the FEMP site's existing treatment system and discharged to the Great Miami River. As of October 1, 1992, more than 943 cubic meters (249,000 gallons) of water had been extracted from the perched water zones beneath FEMP site buildings.

- South Groundwater Contamination Plume: This removal action is designed to protect public health by limiting access to uranium-contaminated groundwater in an area south of the FEMP site. The action consists of five parts. Part 1, activated in May 1992, provides an alternate water supply to an industrial user affected by the contamination plume. Part 2, initiated in July 1992, consists of the installation of a recovery well system to remove the contaminated water and pump it to the FEMP site for treatment, monitoring, and discharge. It also includes increasing the pump-out capacity of the storm water retention basin to reduce the potential for future overflows. Pumping of the recovery wells is projected to continue for about 25 years. Part 3 is construction of an interim advanced waste water treatment system to remove uranium from FEMP site waste water streams. Part 4, implemented through the FEMP's existing groundwater monitoring program, involves monitoring and institutional controls to prevent the use of contaminated groundwater by including more frequent monitoring of private wells located near areas of known contamination. Part 5 is additional investigations to identify the location and extent of any remaining contamination attributable to the FEMP site south (downgradient) of the recovery wells being installed under Part 3.

- Plant 1 Pad Continuing Release: The purpose of this removal action is to protect surface soils and regional groundwater from continuing releases of hazardous materials resulting from waste management activities on the 3.2 hectares (8-acre) Plant 1 pad. Phase 1 of the three phase program, the installation of run-on and runoff controls and underground utilities, is complete. Phase 2, completed in

December 1992, included construction of a new concrete storage pad 7432 m^2 (80,000 ft^2) adjacent to the Plant 1 pad, and two covered storage structures on the new pad that are equipped with containment facilities for spill control and drainage. Phase 3, scheduled for completion by February 1995, consists of upgrading the existing Plant 1 pad and installing a polyethylene liner and epoxy coating over the pad surface to minimize contaminant migration to the environment.

- Removal of Waste Inventories: This removal action, expected to continue through September 1997, involves the characterization, overpacking, and disposition of low-level radioactive waste materials. The FEMP site has approval from the DOE-Nevada Operations Office to dispose of five general waste streams at NTS: process area scrap wastes (scrap metal and wood); construction and removal action waste (demolition debris); residues and thorium waste (refinery feed and oxides); and baled trash. The approval includes all backlog and currently generated wastes at the FEMP site meeting NTS waste acceptance criteria. Shipment of 1621 drums of low-level thorium oxide waste was completed in September 1992. DOE-Fernald is seeking approval from the Nevada Operations Office to ship additional low-level thorium waste to NTS. DOE-FN met its goal of shipping 100,000 drum equivalents of low-level waste to NTS in fiscal year 1992. The shipping goal for fiscal year 1993 is 67,000 drum equivalents, including waste currently generated from construction and restoration activities and characterized backlog waste.

- Safe Shutdown: This removal action, to continue through September 1995, is intended to ensure the safe and permanent shutdown of production facilities, including the removal of uranium and other process and raw materials from equipment and process lines in the former production area. Disposition of uranium products and recoverable residues is an integral part of Safe Shutdown activities. Preliminary assessments of the scope of actions required for safe shutdown of buildings and equipment have been completed for Plants 1, 2/3, 4, 8, and 9. Assessments for Plants 5, 6, and the Pilot Plant are nearing completion.

- Plant 1 Ore Silos: This removal action, scheduled for completion by December 1994, involves the dismantling of the Plant 1 ore silos and their support structures. Deteriorated valves caused the silos to leak material onto a concrete pad in February 1992. The cold raffinate material is the waste residue from the processing uranium ore. Remaining material in the silos will be removed, containerized, and placed in safe storage pending final disposition. All 14 silos and support structures will be dismantled and demolished. The contract to perform the work was awarded in September 1992 and field activities began on October 18, 1992.

- Scrap Metal Piles: This removal action began in 1992 and will be completed in 1995. It is intended to stabilize and disposition low-level radioactive waste scrap metal currently stockpiled outdoors at the FEMP site. The action is designed to eliminate the potential for releases to the environment from 1179 metric tons (1300 tons) of scrap copper and approximately 2722 metric tons (3000 tons) of other recoverable scrap metals. Containerization of the scrap copper pile was completed in November 1992 and a vendor is expected to be selected in Fall 1993 to process the copper through recycling or beneficial reuse. Scientific Ecology Group of Oak Ridge, Tennessee, was awarded the contract for

disposition of 2005 metric tons (2210 tons) of ferrous scrap metal, most of which will be reused. Field activities and containerization of the piles began November 1992. Phase 1 is on schedule for completion by March 1994. Phase 2 is to be complete by May 1995. Nonrecoverable scrap metal at the FEMP site is being packaged and shipped off the site under Removal Action No. 9, Removal of Waste Inventories.

- Improved Storage of Soil and Debris: This removal action, scheduled for completion in March 1995, provides for the improved storage and management of contaminated soil and debris generated as result of cleanup work at the FEMP site. Activities include characterization, interim storage, and management of contaminated soils and debris until their final remediation under Operable Unit 3. Tension support structures, similar to those being used to provide indoor storage for drummed wastes on the Plant 1 pad, will be used to provide improved storage of soil and debris and mitigate the potential spread of contamination.

- Plant 7 Dismantling: This removal action consists of the decontamination and demolition of Plant 7. Characterization is currently in progress. Plant 7, which was originally built to convert uranium hexafluoride to uranium tetrafluoride, has been idle since the mid-1950s and all process equipment was removed in the late 1950s. The plant is currently used for storage of empty cans and drums.

- Pilot Plant Sump: This removal action is concerned with an out-of-service sump at the Pilot Plant. The below-grade sump is a stainless steel cylinder approximately 0.6 meters (2 feet) in diameter and 3 meters (10 feet) deep which was installed to remove liquids from the floor drains of the Pilot Plant during a 1969 renovation. Sludges and liquids from the sump have high concentrations of lead, copper, chromium, nickel, thorium, and volatile organic compounds. Under the removal action, the sump will be removed and its piping disconnected. The drain piping integrity will be checked, the drain system plugged, and adjacent soils cleaned up as required. A revised work plan for this action was submitted to EPA and OEPA in October 1992.

- Nitric Acid Tank Car and Area: This removal action is intended to remove the residual contents of a nitric acid railroad tank car, decontaminate and dispose of the tank car itself, and address potentially contaminated soils adjacent to the tank car. The tank car, which stored nitric acid from 1952 to 1989, has a capacity of 45,359 kilograms (100,000 pounds) and now contains approximately 0.38 cubic meters (100 gallons) of dilute nitric acid. The final draft work plan for this action was submitted to EPA in December 1992.

- Asbestos Removal (Asbestos Program): This ongoing removal action documents asbestos abatement activities at the FEMP site to mitigate the potential for contamination release and migration. Activities within the Asbestos Program include repairs, encasement, encapsulation, or removal of asbestos-bearing materials which exist in many buildings at the FEMP site. EPA approved work procedures for the action in September 1992.

- Management of Contaminated Structures at the FEMP Site: This removal action is intended to allow accelerated cleanup of select contaminated structures at the FEMP site. Characterization data are being gathered and required work activities formulated in support of the removal action. An Engineering Evaluation/Cost Analysis prepared to identify the preferred alternative for this cleanup was submitted to EPA on December 16, 1992.

ATTACHMENT G.III

DESCRIPTION OF OTHER SITES POTENTIALLY AFFECTED BY OPERABLE UNIT 1 REMEDIAL ACTIVITIES

ATTACHMENT G.III

DESCRIPTION OF OTHER SITES POTENTIALLY AFFECTED BY OPERABLE UNIT 1 REMEDIAL ACTIVITIES

G.III.1 NEVADA TEST SITE

A LRA for the waste material of Operable Unit 1 calls for the disposal of wastes at an existing government facility located in an arid western environment. This facility is currently operating and accepting many types of DOE waste. An EIS for waste disposal activities at the NTS is currently in process to satisfy the requirements of NEPA. Several disposal technologies are currently utilized at NTS (e.g., shallow land burial, burial in trenches, and disposal in large-diameter augured shafts). However, only shallow land burial is utilized for LLW. However, mixed waste in not currently accepted at the facility. Because the facility is located in an area with an arid climate far from any population centers and significant water sources, it offers many advantages from a long-term risk standpoint. An interim on-site storage facility can be a part of this process option if the administrative and regulatory issues for off-site waste disposal have not been resolved at the start of remediation. The wastes could be transported to the facility by truck or rail as discussed elsewhere in this appendix.

Human habitation of the NTS area ranges from as early as 10,000 B.C. to the present. Various aboriginal cultures occupied the NTS area over this extended period as evidenced by the presence of artifacts at many sites and more substantial deposits of cultural material in several rock shelters. This period of aboriginal occupation was sustained primarily by a hunting and gathering economy based on using temporary campsites and shelters. The area was occupied by Paiute Indians at the time of the first known outside contact in 1849 (DOE 1992a).

The NTS has been the primary location for testing the nation's nuclear explosive devices since January 1951. The NTS is operating by the DOE as the on-continent test site for nuclear weapons testing. It is located in Nye County, Nevada, with the southeast corner lying about 105 kilometers (65 miles) northwest of the city of Las Vegas, Nevada. The NTS

encompasses about 3500 square kilometers (1350 miles), an area larger than the state of Rhode Island. The dimensions of the NTS vary from 46 to 56 kilometers (28 to 35 miles) in width (eastern to western border) and from 64 to 88 kilometers (40 to 55 miles) in length (northern to southern border). The NTS is surrounded on the east, north, and west sides by public access exclusion areas consisting of the Nellis Air Force Base Bombing and Gunnery Range and the Tonopah Test Range. These two areas comprise the Nellis Air Force Base Range Complex, which provides a buffer zone between the test areas and public lands. The combination of the Nellis Air Force Base Range Complex and the NTS is one of the larger unpopulated land area in the United States, comprising some 14,200 square kilometers (5470 square miles). Mercury, Nevada, located at the southern end of the NTS, is the main base camp for worker housing and administrative operations for the site. Area 12 Base Camp, located at the northern end of the site, is the other major worker housing and operations support facility (DOE 1992a).

The topography of the NTS is typical of much of the Basin and Range physiographic province of Nevada, Arizona, and Utah. North-south-trending mountain ranges are separated by broad, flat-floored, and gently-sloped valleys. Elevations range from about 910 meters (3000 feet) above mean sea level in the south and east, rising to 2100 meters (6900 feet) in the mesa areas towards the northern and western boundaries. The slopes on the upland surfaces are steep and dissected, whereas the slopes on the lower surfaces are gentle and alluviated with rock debris from the adjacent highlands. The principle effect upon the terrain from nuclear testing has been the creation of numerous dish-shaped surface subsidence craters, particularly in Yucca Flat. There are not continuously flowing streams on the NTS. Surface drainages from the Yucca Flat and Frenchman Flat are in closed-basin systems, which drain onto the dry lake beds (plays) in each valley. The remaining area of the NTS drains via arroyos and dry streambeds that carry water only during unusually intense or persistent storms. Rainfall or snow melt typically infiltrates quickly into the moisture deficient soil or runs off in normally dry channels, where it evaporates or seeps into permeable sands and gravels. During extreme conditions, flash floods may occur. The northwest portion (Paiute Mesa) of the NTS has integrated channel systems which carry runoff beyond NTS boundaries into the

closed basins and plays in Kawich Valley and Gold Flat on the Nellis Air Force Base Range Complex. The western half and southernmost part of the NTS have channel systems which carry runoff from intense storms towards the southern boundary of the NTS and off site towards the Amargosa Desert (DOE 1992a).

In general, the geology consists of three major rock units. These are: (1) completely folded and faulted sedimentary rocks of Paleozoic age overlain at many places by (2) volcanic tuffs and lavas of Tertiary age, which (in the valleys) are covered by (3) alluvium of late Tertiary and Quaternary age. The sedimentary rocks of Paleozoic age are many thousands feet thick and are comprised mainly of carbonate rocks (shale and quartzite). The volcanic rocks are relatively unreformed, and dips are generally gentle. The alluvium is derived from erosion of the nearby hills of tertiary and Paleozoic rocks. The volcanic rocks of Tertiary age are predominantly tuffs, which erupted from various volcanic centers, and lavas, and mostly rhyolitic composition. The aggregate thickness of the volcanic rocks is many thousands offset, but in most places the total thickness of the section is far less because of erosion or nondeposition. These materials erupted before the collapse of large volcanic centers known as calderas. Alluvial materials fill the intermountain valleys and cover the adjacent slopes. These sediments attain thickness of 600 to 900 meters (2000 to 3000 feet) in the central portions of the valleys. The alluvium in Yucca Flat is vertically offset along the prominent north-south-trending Yucca fault.

Depths to groundwater beneath the NTS vary from about 157 meters (515 feet) beneath the Frenchman Flat playa (Winograd and Thordarson 1975) in the southern part of NTS to more than 610 meters (2000 feet) beneath part of Paiute Mesa. In the eastern portions of the NTS, the water table occurs generally in the alluvium and volcanic rocks above the regional carbonate aquifer. The flow in the shallower parts of the groundwater body is generally toward major valleys (Yucca and Frenchman) where it deflects downward to join the regional drainage to the southwest in the carbonate aquifer. The hydrogeologic units at the NTS occur in three groundwater subbasins in the Death Valley groundwater basin. Groundwater beneath the eastern part of the NTS is in the Ash Meadows subbasin defined by discharge through

evapotranspiration along a spring line in Ash Meadows (south of the NTS). Most of the western NTS is in the Alkali Flat/Furnace Creek Ranch subbasin, which discharges by evapotranspiration at Alkali Flat and by spring discharge near Furnace Creek Ranch. Groundwater beneath the far northwestern corner of the NTS may be in the Oasis Valley subbasin, discharging by evapotranspiration in the Oasis Valley (DOE 1992a).

A long-term hydraulic monitoring program was instituted in 1972 to be operated by the EPA under an interagency agreement. Groundwater was monitored on and surrounding the NTS, at eight sites in other states, and at two locations off property in Nevada in 1991 to detect the presence of any radioactivity in the groundwater. No radioactivity was detected in the groundwater sampling network around NTS. The NTS groundwater monitoring network currently utilizes wells that were drilled for water supply or exploratory purposes. Therefore, an extensive program to install groundwater monitoring wells has been implemented. The program will involve the installation of approximately 90 wells on or near the NTS.

Precipitation levels on the NTS are low, runoff is intermittent, and the majority of the active testing areas on the NTS drain into closed basins on the site. The NTS mesas receive an average annual precipitation of 23 centimeters (9 inches), which includes winter snow accumulations. The lower elevations receive approximately 15 centimeters (6 inches) of precipitation annually, with occasional snow accumulations lasting only a matter of days (Quiring 1968). Predominating winds are southerly during summer and northerly during winter. The prevailing wind direction during winter months is from north-northeast, and during summer months, winds prevail from the south. In Yucca Flat, the average annual wind speed is 11 kilometers per hour (7 miles per hour). The prevailing wind direction during the winter months is north-northwest and during summer months is south-southwest. At Mercury, the average annual wind speed is 13 kilometers per hour (8 miles per hour), with a prevailing wind direction of northwest during the winter months and southwest during the summer months.

The greater part of the NTS is vegetated by various associations of desert shrubs typical of the Mojave or Great Basin Deserts or the zone of transition desert between these two. There are areas of desert woodland (pinon and juniper) at higher elevations. Even there, typical Great Basin shrubs, principally sagebrushes, are a conspicuous component of the vegetation. Although shrubs (or shrubs and small trees) are the dominant forms, herbaceous plants are well represented in the flora and play an important role in supporting animal life.

Extensive floral collection has yielded 711 taxa of vascular plants within or near the boundaries of the NTS. Associations of creosote brush *(Larrea tridentata)*, which are characteristic of the Mojave Desert, dominate the vegetation mosaic on the bajadas of the southern NTS. Between 1220 and 1520 meter (4000 and 5000 feet) elevations in Yucca Flat, transitional associations are dominated by hopsage/desert thorn *(Grayia spinosa/Lycium andersonii)* associations, while the upper bajadas support *Coleogyne* types. Above 1520 mile (5000 feet), the vegetation mosaic is dominated by sagebrush associations of *Artemisia tridentata* and *Artemisia arbuscula* ssp. *nova*. Above 1830 meters (6000 feet), pinon pine and juniper mix with the sagebrush associations where there is suitable moisture for these trees. No plant species located on the NTS is currently on the federal endangered species list; however, the state of Nevada has placed *Astragalus beatleyae* on its critically species list. Most mammals on the NTS are small and secretive (often nocturnal in habitat), hence not often seen by casual observers; larger mammals include horses, burros, deer, mountain lions, bobcats, coyote, kit foxes and rabbits. Reptiles include four species of venomous snakes; bird species are mostly migrants or seasonal residents. In terms of distribution or relative abundance, rodents are the most important group of mammals on the NTS. Most nonrodent mammals have been placed in the "protected" classification by the state of Nevada. In 1989, the desert tortoise *(Gopherus agassizii)* was placed on the endangered species list by the U.S. Department of Interior and was relisted as threatened in 1991. Tortoise habitats on the NTS are found in the southern third of NTS outside the current areas of nuclear test activities in Yucca Flat, Rainer Mesa, and Paiute Mesa.

There are many archaeological sites on the Paiute and Rainer Mesas testing areas. In addition to the archeological sites, there are also some sites of historical interest on the NTS. The principle sites include the remains of primitive stone cabins with nearby corrals at three springs, a natural cave containing prospector's paraphernalia in Area 30, and crude remains of early mining and smelting activities (DOE 1992a).

In 1991, 17 pre-activity surveys were conducted for archeological sites on the NTS, and reports on the findings were prepared. These pre-activity surveys identified 56 sites containing previously unknown archeological information. These sites were added to the cultural resources inventory files, site records, and all artifacts collected from the NTS were processed for storage. Due to avoidance of all potentially significant sites by activities at the NTS, no test excavations, data recovery plans, or data-recovery projects were undertaken in 1991.

Excluding Clark County, the major population center (approximately 741,000 in 1990), the population density within a 150-kilometers (93-miles) radius of the NTS is about 0.5 person per square kilometers (1.3 persons per square mile). In comparison, the 48 contiguous states (1990 census) had a population density of approximately 29 persons per square kilometer (75 persons per square mile). The estimated average population density for Nevada in 1990 (including Clark County) was 2.8 persons per square kilometer (7.3 persons per square mile). The off-site area with 80 kilometers (49.7 miles) of the NTS Control Point is predominantly rural. CP-1 (a building at the Control Point) historically has been the point from which distances from the NTS were determined.

Several small communities are located in the area, the largest being in the Pahrump Valley. This growing rural community, with an estimated population of 15,000, is located 80 kilometers (49.7 miles) south of CP-1. The Amargosa Farm area, which has a population of about 950, is located about 50 kilometers (31.1 miles) southwest of CP-1. The largest town in the near off-site area is Beatty, which has a population of about 1500 and is located approximately 65 kilometers (40.4 miles) to the west of CP-1. The Mojave Desert of

California, which includes Death Valley National Monument, lies along the southwestern border of Nevada. The National Park Service (NPS 1990) estimated that the population within the Monument boundaries ranges from a minimum of 200 permanent residents during the summer months to as many as 5,000 tourists and campers on any particular day during "Death Valley Days" in the month of November. The largest nearby population in this desert is the Ridgecrest-China Lake area about 190 kilometers (118 miles) southwest of the NTS containing about 28,000 people. The next largest is in the Barstow area (104 square kilometers or 40 square miles) located 265 kilometers (165 miles) southwest of the NTS with a 1991 population of 21,000. The Owens Valley, where numerous small towns are located, lies 50 kilometers (31 miles) west of Death Valley. The largest town in the Owens Valley is Bishop, located 225 kilometers (140 miles) northwest of the NTS, with a population of 3500.

Recreational areas lie in all directions around the NTS and are used for such activities as hunting, fishing, and camping. In general, the camping and fishing sites to the northwest, north, and northeast of the NTS are utilized throughout the year except for the winter months. Camping and fishing locations to the southwest, south and southwest are utilized throughout the entire year. The peak hunting season is from September through January.

G.III.2 REPRESENTATIVE PERMITTED COMMERCIAL DISPOSAL FACILITY AT CLIVE, UTAH

A leading remedial alternative for waste material of Operable Unit 1 calls for the disposal of wastes at a permitted commercial disposal facility in Clive, Utah. The facility is located on the eastern edge of the Great Salt Lake Dessert, 4.8 kilometers (3 miles) west of the ceder mountains. Owned by the State of Utah, the 16 kilometers (10 miles) area around the site is rarely used due to its remoteness from urbanized areas. The area is uninhabited by humans and only occasionally used for grazing and off-road vehicles. The only other use of lands within the 16 kilometers (10 miles) radius is for transportation. Interstate 80 highway and the Union Pacific railway pass 4 kilometers (2.5 miles) and 1.6 kilometers (1 mile) north, respectively, of the site (DOE 1984). Because the facility is located in an area with an arid

climate far away from any population centers, the lack of human habitation offers many advantages from a long-term risk standpoint.

The representative permitted commercial disposal facility site has probably been used for grazing since the early settlers. No events of historical significant are known to have occurred on the site. The Donner Trail probably passed north of the site, but the trail's exact location is unknown. A cultural resource inventory for the facility was performed in August 1981 by the Archaeological Environmental Research Corporation (DOE 1984). No cultural resource sites were found. The Ground to Air Pilotless Aircraft Launch Site and Blockhouse is listed in the National Register of Historic Places and is located approximately 16 kilometers (10 miles) west of the facility. The Isopia Settlement Cemetery site is located to the southeast of Clive (approximately 37 kilometers [23 miles]). These are the historical sites closest to the transportation corridor that would be used with the implementation of Alternative 5B.

The proposed disposal site is located in the Basin and Range physiographic province which covers nearly all of Nevada and parts of California, Oregon, Idaho, Arizona, New Mexico, and Texas. It is characterized by broad, flat basins occasionally interrupted by small mountain ranges. The area within a 16 kilometers (10 miles) radius is typical of this province. Because of the flatness of the terrain, vistas of 48 kilometers (30 miles) are common. The Bureau of Land Management Visual Resource Inventory and Evaluation System (DOE 1984), was used to rate the scenic quality of the disposal facility relative to the physiographic province. This system employs a scale of 0 to 33, with higher ratings (19 or above) indicating that special management attention is required. The combination of landform, vegetation, water, color, influence scarcity, and cultural modification variables were used to derive a total score of 12 for the area surrounding the disposal facility. This low-to-medium rating for scenic quality indicates that no special management attention is required for the site.

The permitted commercial disposal facility is located within a relatively flat area along the eastern edge of the Great Salt Lake Desert. The desert area extends for approximately 96

kilometers (60 miles) from the Nevada border on the west to a series of north-south-trending mountain ranges on the east. The eastern edge of the desert in the vicinity of the site is formed by the Ceder Mountains, which rise to elevations of approximately 2346 meters (7700 feet), approximately 1066 meters (3500 feet) above the desert floor. The proximity of this mountain range results in a generally westward slope to the site, with drainage into the Great Salt Lake Basin. The site has a topographic relief of less than 3.3 meters (11 feet).

Because of the lack of detailed subsurface data concerning the bedrock, the exact depth to and relationships among various units at the disposal facility are unknown (DOE 1984). Lone Mountain, located 4.8 kilometers (3 miles) east of the site, has a core of Paleozoic rocks. These include, from west to east, the Grandeur Member of the Park City Formation, an unnamed Permian formation, and Unit 5 of the Oquirrh Formation. These well-indurated limestones and sandstones strike slightly east to north and dip steeply (27 to 74 degrees) to the west. Lone Mountain represents the west limb of a north-trending anticline, which is in turn located on the upper plate of the Lone Mountain Thrust Fault, a slightly northwest-trending Laramide (early Tertiary) low-angle fault.

The scattered, low hills about 2.4 kilometers (1.5 miles) west of the disposal facility site also contain outcrops of Paleozoic Oquirrh Formation (DOE 1984). These rocks may represent the northern extent of a slightly northeast-trending overturned anticline. The facility may be located in the syncline between this anticline and the Lone Mountain anticline to the east.

The Grayback Hills 5.6 kilometers (3.5 miles) northwest of the disposal facility (just north of Interstate 80) are formed by remnants of Late Tertiary basalt and basaltic andesite flows (DOE 1984). These flows are the only apparent evidence near the site of Late Tertiary tectonism.

The representative commercial disposal facility site lies in a region which contains active faulting. Seismogenic sources include zones of faulting along the east flank of the Ceder Mountains, the east flank of the Newfoundland Mountains, the west flank of the Stansbury

Mountains, and within Puddle Valley. The density of possible seismogenic sources is considerably less than along the Watsatch Front located about 104 kilometers (65 miles) east of the disposal facility. The site is located within the Great Basin in the Basin-and-Range Province in western Utah. It lies in a transition zone between exposed Basin-and-Range Province horsts and grabens (mountain ranges and valleys) to the east and buried Basin-and-Range Province horsts and grabens to the west. The surrounding area does not have recorded historical seismicity but nearby seismogenic areas and geologic structures could pose a hazard to the site.

Surface and subsurface conditions at the disposal facility and vicinity were evaluated through the drilling, logging, and sampling of 13 exploration borings. The logs of the exploration borings are available in the Uranium Mill Tailings Remedial Action Project Office in Albuquerque, New Mexico. Surficial soils encountered in the 13 exploration borings generally consist of light brown to tan, sandy to clayey silt. These soils were classified as either stiff or very stiff and were noted to contain a small pinhole structure and bedding layers that range from approximately .018 to 3.6 meters (.06 to 12 feet).

Underlying the surficial material is an interlayered lacustrine deposit ranging from relatively clean fine-and medium-grained sands to silty clays. This interlayered soil sequence appears to be random and no definite pattern or predominant material type could be correlated among individual borings. The soils are layered but varied in thickness from about generally classified as stiff to very stiff while the cohesionless materials were generally medium dense to dense. This interlayered sequence extends to depths between 13.7 and 15.5 meters (45 and 51 feet).

No surface water bodies are present on the commercial disposal site area. The nearest stream channel ends about 3.2 kilometers (2 miles) east of the site and is typical of all the drainages along the transportation corridors within about 34 kilometers (20 miles). The site lies to the west of the Ceder Mountains in a relatively flat basin. The streams within the area do not

reach the site; the channels end 3.2 kilometers (2 miles) east of the site. This indicates flows normally infiltrate or evaporate before reaching the site.

The site is located within the Great Salt Lake Desert. The two major groundwater systems in the area are the valley fill and the alluvial fans bordering the desert. Recharge in the area site to the alluvial fill and the mountains bordering the desert are the Ceder Mountains east of the site. Direct infiltration of incident precipitation is not a significant component of the total groundwater regimen. Groundwater monitoring wells indicate groundwater lies 6 to 9 meters (20 to 30 feet) below ground surface. The principle direction of groundwater flow within the disposal site region is to the west. Locally, however, the direction of the groundwater flow is modified by both the surface topography and by the stratigraphy at depth. Site specific, the direction of groundwater movement appears to be mainly to the northeast. The hydraulic gradient in this direction is small, approximately .91 meters (3 feet) per mile.

The surrounding area is arid dessert. Temperatures range from -2.7° C (27°F) in January to 26°C (79°F) in July. Normal extremes range from nighttime lows of -7.9°C (19°F) in January to daytime highs of 33.3°C (92°F) in July. The average rainfall is only 12.7 centimeters (5 inches) per year. Thunderstorms occur in the summer and occasional snowfall in the winter.

Soils at the disposal facility site are characterized as having a horizon of clay and alkali (sodium) accumulation. The soils lacks moisture for plant growth for long periods and is low in organic matter (DOE 1984). The dry subsurface soils are powdery and easily dispersed in the air by traffic of any kind. These highly saline, slowly permeable soils in this extremely arid location are unsuitable for reestablishing a lasting, self-sustaining vegetation to protect the soil covering the disposed materials. Even if the low precipitation could be overcome by irrigation, the nature of the soils would impose insurmountable problems that would prevent satisfactory plant cover within 10 to 20 years (DOE 1984). Soils with these characteristics will act as a barrier to all but the most shallowly rooted plant species, and density of the clay will deter burrowing by small animals.

The vegetation of the disposal facility site is a homogeneous, semi-desert low shrubland, primarily composed of shadscale *(Atriplex confertifolia)*. The shrubland is part of the Northern Desert Shrub Biome of the Cold Desert Formation (DOE 1984). Plant communities identified on the site are Shadscale-Gray Molly *(Kochia americana var. vestita)*, a transitional community type of Shadscale-Gray Molly-Black Greasewood *(Sarcobatus vermiculatus)*, and Black Greasewood-Garder Saltbush *(Atriplex nuttallii)*. Vegetation patterns at the site are correlated with soil salinity and corresponding shifts in presence or abundance of species. All three communities are low in species diversity. Seep-weed or inkweed *(Suaeda torreyana)* and scattered perfoliate pepperweed *(Lepidium perfoliatum)* are the only prominent understory species of the Shadscale-Gray Molly community. This community occurs over most of the site, although black greasewood becomes prominent enough on the eastern quarter to form a Shadscale-black Greaseweed-Gray Molly community (DOE 1984).

Two habitat types occur on the disposal site; shadscale flats and greaswood. Animal species typically include the black-tailed jackrabbit *(Lepus californicus)*, the deer mouse *(Peromyscus maniculatus)*, the horned lark *(Eremophila alpestris)*, and the desert horned lizard *(Phrynosoma platyrhinos)*; species diversity is low. All of these animal species could use the site for breeding or nesting. Aquatic ecosystems do not occur on the disposal site nor do any threatened or endangered species reside in the area.

The representative commercial mixed waste disposal facility is located in Tooele County, Utah. The county encompasses 700 square miles within the state and had a population in 1990 of 26,000 representing approximately 1.5 percent of the population of Utah. (The population of Utah was 1,723,000 in 1990). The population in Tooele County has increased on the average 3.2 percent between 1970 and 1980; however, it remained constant over the past ten years at approximately 26,000.

Most lands within a 16 kilometers (10 miles) radius of the site are used very rarely because of their remoteness from urbanized areas and the poor spill, occasional muddy conditions, and sparse vegetation characteristic of the region. Sheep grazing and recreational-vehicle driving

are the primary uses made of the area, but such uses are apparently light. Although no reports on land uses in the vicinity could be found, numerous trails in the area indicate that it has been used on occasion for recreational vehicle purposes, and much of the vicinity may be used on occasion for hunting. The only other use of lands within a 16 kilometers (10 miles) radius is for transportation. Interstate 80 and the Union Pacific System railway pass 4 kilometers (2.5 miles) and 1.6 kilometers (1 mile) north, respectively, of the site.

APPENDIX H

OPERABLE UNIT 1
FLOODPLAIN/WETLAND ASSESSMENT

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
DOE	U.S. Department of Energy
EA	Environmental Assessment
EPA	Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FS/PP-EA	Feasibility Study/Proposed Plan-Environmental Assessment
ft	feet
HEPA	high-efficiency particulate air (filter)
MSL	mean sea level
OEPA	Ohio Environmental Protection Agency
NTS	Nevada Test Site

H.1.0 INTRODUCTION

The Fernald Environmental Management Project (FEMP) is divided into five distinct operable units. The subject of the Feasibility Study/Proposed Plan-Environmental Assessment (FS/PP-EA) and the Floodplain/Wetland Assessment is Operable Unit 1, which consists of six waste pits, the Burn Pit, the Clearwell, and associated structures, equipment, and soil embankments. The purpose of the FS/PP-EA for Operable Unit 1 is to evaluate the range of available remedial action alternatives for addressing the permanent disposition of the waste materials, soils, surface water, and perched water incidental to waste pit remediation within Operable Unit 1. The primary objective of the Operable Unit 1 remedial action is to protect human health and the environment by implementing long-term remedial solutions.

Executive Order 11990 (Protection of Wetlands), Executive Order 11988 (Protection of Floodplains), and U.S. Department of Energy (DOE) Regulation 10 Code of Federal Regulations (CFR) 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements," specify the requirements for a Floodplain/Wetland assessment where DOE is responsible for providing federally undertaken, financed, or assisted construction and improvements. Pursuant to 10 CFR 1022.5 and 1022.11, the DOE has determined a Floodplain/Wetland Assessment is applicable to the representative alternative being considered for the purpose of the evaluation in this appendix. A Floodplain/Wetland Notice of Involvement concerning the FS/PP-EA will be issued in the Federal Register to satisfy public notice requirements of 10 CFR 1022.14.

H.2.0 PURPOSE AND NEED

Facilities and environmental media at the FEMP site contain radioactive and chemical constituents at levels which exceed certain federal and state standards for protecting human health and the environment. While human populations are not presently impacted by Operable Unit 1, the purpose of the FS/PP-EA is to evaluate and propose a remedial action alternative to preclude potential impacts in the future. The alternatives evaluated in the FS/PP-EA would require activities on site that would impact wetlands and floodplains. Therefore, DOE is preparing this Floodplain/Wetland Assessment.

H.3.0 DESCRIPTION OF THE PROPOSED ACTION

The preferred alternative being proposed for Operable Unit 1 in the Proposed Plan involves excavation, drying, and off-site shipment and disposal to a permitted commercial disposal facility. The pit waste, caps, and liners would be excavated and transferred to a controlled stockpile where the waste streams can be blended and directed into a shredder which feeds the dryers. The waste would be blended and dried to assure that all material shipped to the disposal facility meets the waste acceptance criteria. The blended waste would be fed into the shredder, thus, homogenizing and reducing particle size of the waste. The shredded waste would be fed into the rotary dryer which would dry the material to a moisture content of no more than 15 percent.

The treated material would be loaded into lined rail cars and transported to the permitted commercial disposal facility. Waste that does not meet acceptance criteria, not to exceed 10 percent of the total waste volume, will be shipped to Nevada Test Site in 11.5 cubic meters (15 cubic yards) disposable containers. Surface soils would be removed from the affected areas of Operable Unit 1, and transported to Operable Unit 5 for management. Contaminated residual soils below the pit liners would be removed and transported to Operable Unit 5 for management. All nonshreddable materials (i.e., tires, cables, and structural steel) discovered during excavation would be transported to Operable Unit 3 for consolidation with other debris and rubble.

H.4.0 FLOODPLAIN/WETLAND EFFECTS

H.4.1 FLOODPLAINS

Floodplains within the FEMP site property are confined to the north-south corridor containing Paddys Run which has also been designated as a water of the United States and the State. Outside the boundaries of the FEMP site, the 100- and 500-year floodplain of the Great Miami River extends west of the "Big Bend" area. The 100- and 500-year floodplain of the river also extends northward along Paddys Run from the confluence of the two streams past the southern boundary of the FEMP site. The 100-year floodplain has been estimated to entail 647.5 hectares (1,600 acres) from mile 19 to mile 24 of the Great Miami River (DOE 1991).

H.4.1.1 Floodplains Adjacent to Operable Unit 1

A study by Parsons (1993) examined the 100- and 500-year floodplain along Paddys Run (Figure H.4-1). The results of this study predicted a 100-year flood flow of approximately 315.8 cubic meters per second (11,150 cubic feet per second). Elevations range from 542 feet above mean sea level (MSL) at the southern boundary of the floodplain study area to 567 feet MSL at the northern tip (Figure H.4-1). In the area adjacent to Operable Unit 1, the 100- and 500-year floodplain are contiguous due to the relatively steep slopes along the banks of Paddys Run. The floodplain approximately follows the 560 feet MSL contour adjacent to the western boundary of Operable Unit 1.

H.4.1.2 Floodplain Impacts

The preferred alternative of Operable Unit 1 would result in excavation and grading activities in the 100- and 500-year floodplain along Paddys Run. The disturbance of the floodplain in the short term would occur during excavation of the waste pits and regrading of the excavated pits with clean borrow soil. Upon completion of waste pit contents removal and backfilling with clean soil, the remediated waste pit area will be regraded to establish a drainage pattern into Paddys Run. The final grading of the remediated waste pit area will include moving approximately 335 meters (1,100 feet) of floodplain along the east bank of Paddys Run.

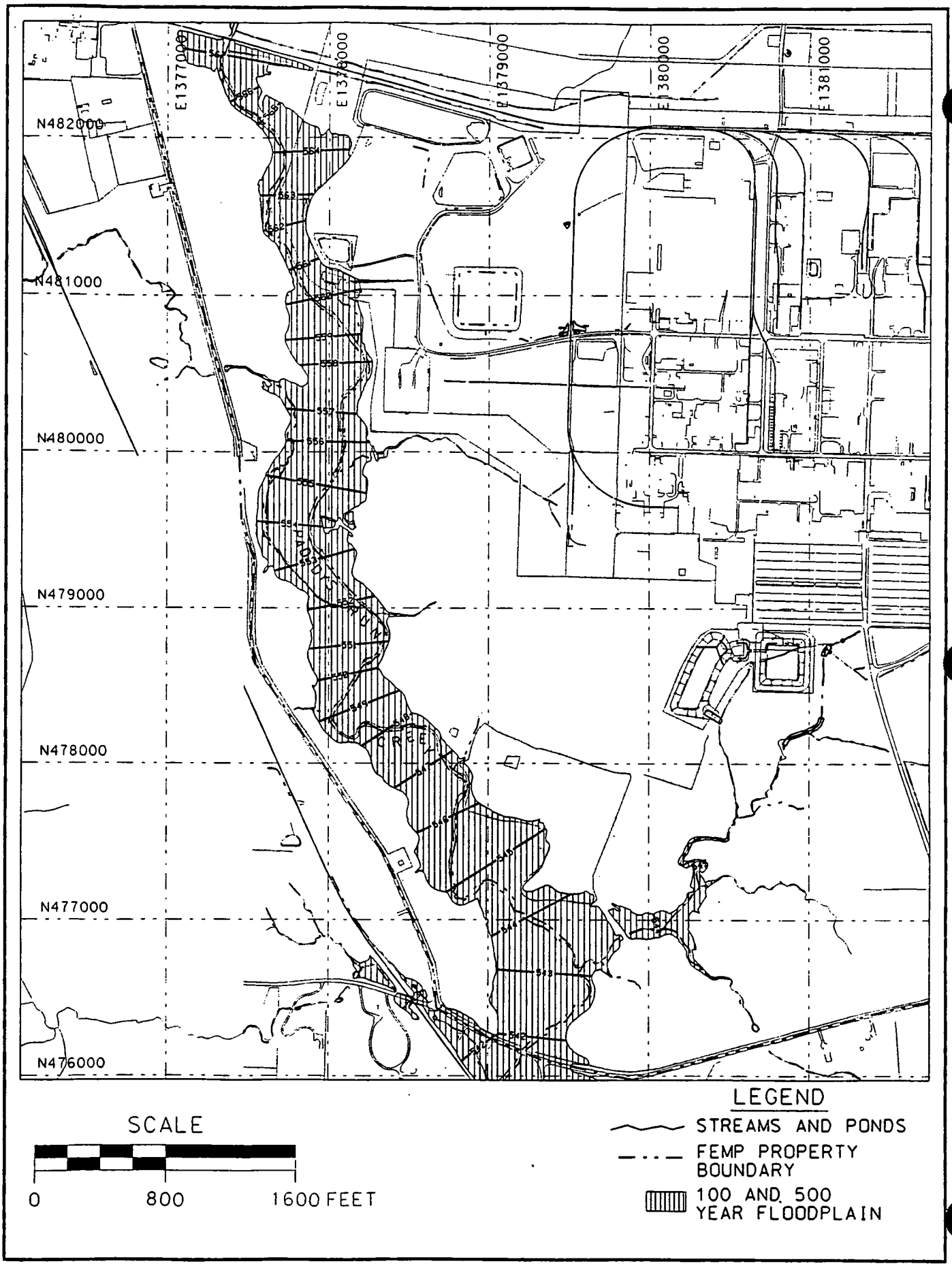

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FIGURE H.4-1. PADDYS RUN CREEK 100 AND 500 YEAR FLOODPLAIN

Currently, the 100- and 500-year floodplain follows the 560 feet MSL contour for the length of Paddys Run along the waste pit area. The 335.3 meters (1,100 feet) stretch that would require action extends from just south of the waste pit area sump and pump station to an area near the south-west corner of Waste Pit 5. The 560-foot MSL contour that defines the floodplain in this area is approximately 60.1 meters (200 feet) away from Paddys Run for the majority of the 335 meters (1,100 feet) length of the east bank. The proposed grading activities would establish the 560-foot MSL contour as much as 182.9 additional meters (600 feet) east of Paddys Run. In turn, this would result in a greater floodplain area east of Paddys Run.

Short-term impacts to Paddys Run during remedial (e.g., grading) activities would include equipment operation, soil stockpiling, and equipment lay down. However, these impacts would be temporary and would be eliminated upon completion of remedial activities. In addition to grading activities, a stone-lined drainage ditch would be installed traversing east to west through the middle of the former waste pit area to an engineered outfall in Paddys Run. The installation of the drainage ditch and engineered outfall would also require the stockpiling of stone and equipment operation.

Long-term impacts to the floodplain associated with remediation of the waste pit area would be minimal. Final grading of Operable Unit 1 would result in an expanded floodplain area along the east bank of Paddys Run. This would result in a positive impact (i.e., a decrease) in flood elevations along Paddys Run. In addition, remediation of Operable Unit 1 would result in the minimization of contaminated runoff into the floodplain and Paddys Run.

The installation of the stone-lined drainage ditch and engineered outfall would result in new permanent structures in the floodplain. However, due to regrading activities the elevations of these structures (550 feet MSL) would be below the original elevations in this area ($\approx$560 feet MSL). Therefore, no increases in flood elevations would occur as a result of these structures. Furthermore, these structures would require only .10 hectare (.25 acre) of the floodplain which is minimal compared to the total area of the floodplain.

In summary, the Operable Unit 1 remedial activities will have temporary impacts on the floodplain in the short-term due to grading, etc. However, over the long-term a positive impact on the floodplain will occur due to an increase in the floodplain area adjacent to the remediated waste pits, thus minimizing the magnitude of downstream flood events. Furthermore, the elimination of contaminated runoff in the floodplain and Paddys Run would have a positive indirect effect.

H.4.2 WETLANDS

A jurisdictional wetland delineation has been approved by the U.S. Army Corps of Engineers (COE) which establishes jurisdictional wetland boundaries and Waters of the United States. Results from the site-wide delineation indicate a total of 14.5 hectares (35.9 acres) of jurisdictional wetlands on the FEMP site (Figure H.4-2). Delineated wetlands included 10.76 hectares (26.58 acres) of palustrine forested wetlands, 2.8 hectares (6.95 acre) of drainage ditches/swales, and 0.96 hectares (2.37 acres) of isolated persistent emergent and scrub/shrub wetlands.

H.4.2.1 Wetlands Within and Adjacent to Operable Unit 1

The delineation was prepared using the Routine Determination On-Site Inspection Method in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual, which revealed a total of 2.42 hectares (5.98 acres) within and adjacent to Operable Unit 1. Wetlands included a 0.72 hectare (1.77 acre) area of isolated scrub-shrub/persistent emergent wetlands west of the waste pits, a 0.08 hectare (.21 acre) area of drainage ditch/swale wetlands south of the waste pits, 0.53 hectare (1.3 acres) of Drainage Ditch/Swale Wetlands east of Operable Unit 1 for an on-property disposal area and approximately 1.09 hectares (2.7 acres) of drainage ditch/swale wetlands in the borrow soil area directly north of the Operable Unit 1 boundary (Ebasco Environmental 1993).

H.4.2.2 Wetland Impacts

Remedial activities implemented for Operable Unit 1 would destroy a total of 2.42 hectares (5.98 acres) within and adjacent to Operable Unit 1. The preferred alternative would result in long-term and direct impacts from the permanent filling of 0.98 hectare (1.98 acres) of scrub-shrub/persistent and drainage ditch wetlands on the east and south sides of the waste pits and 1.09 hectares (2.7 acres) of drainage ditch/swale wetlands in the borrow pit area north of Operable Unit 1. Continuous

equipment traffic and soil removal would result in physical disturbance and filling of wetland areas. Impacts to other wetlands located on the FEMP property would be avoided through the implementation of engineering controls [i.e., runoff protection, high-energy particulate air (HEPA) filtration for treatment facilities, and wetting activities during heavy equipment operation]. Long-term impacts to wetlands from implementing the preferred alternative would be positive as a result of contaminant source removal. Mitigation for wetland impacts would be determined using the 404(b)(1) guidelines of the Clean Water Act in consultation with COE, U.S. EPA and OEPA.

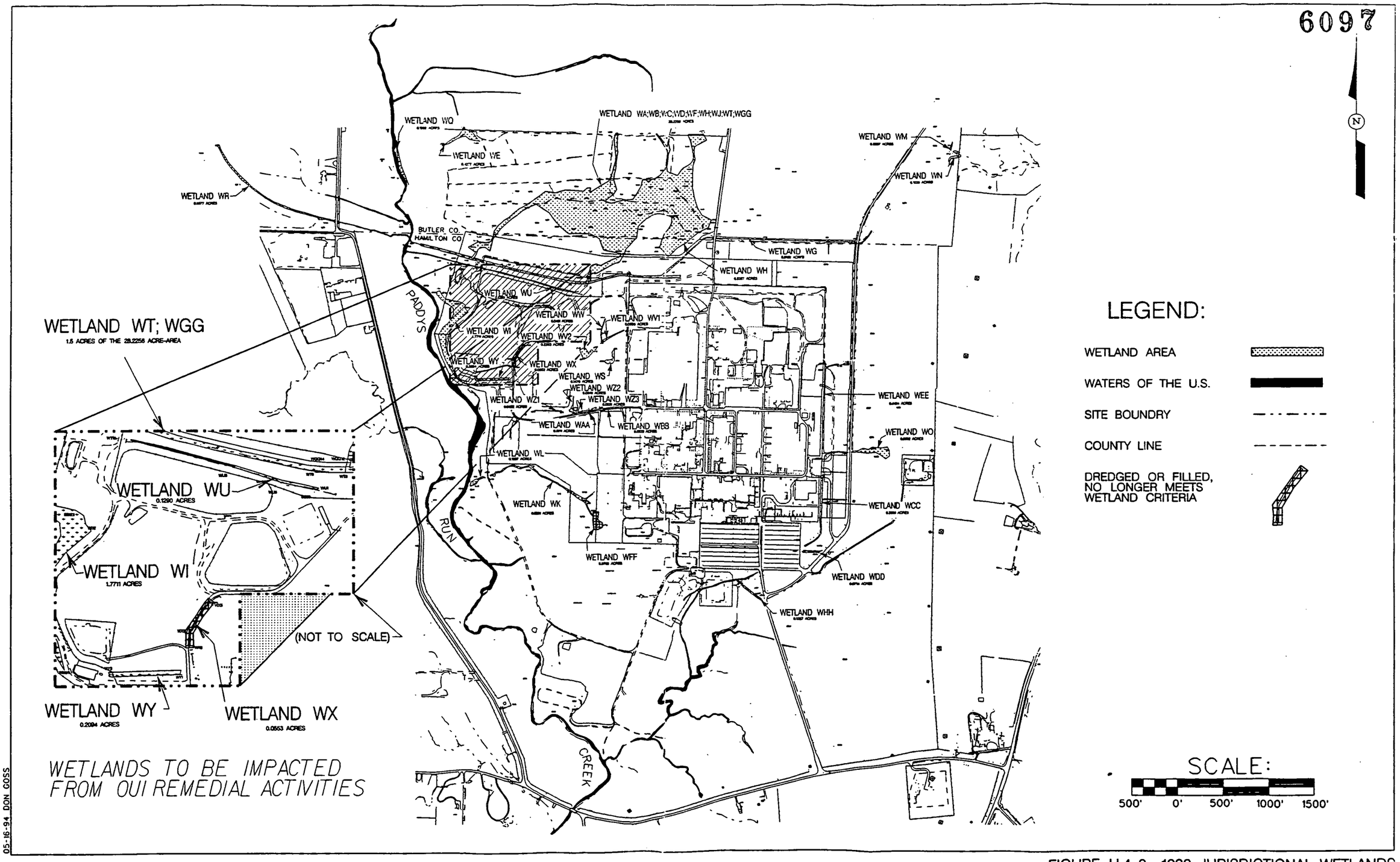

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FIGURE H.4-2. 1993 JURISDICTIONAL WETLANDS & WATERS OF THE U.S. FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

H.5.0 ALTERNATIVES CONSIDERED

H.5.1 No-Action Alternative

Under this alternative, all waste pits, the Burn Pit, and the Clearwell would remain in place as well as all soils within the Operable Unit 1 boundary. The No-Action Alternative would not impact wetlands in the short-term; however, no further action could result in impacts to all wetlands within the FEMP boundaries from the migration of Operable Unit 1 contaminants. Floodplains would remain in place but potentially would become increasingly contaminated as a result of contaminant migration. Furthermore, the No-Action Alternative is not protective of human health and the environment, does not comply with Applicable or Relevant and Appropriate Requirements (ARARs), and does not provide long-term effectiveness and permanence. Therefore, the No-Action Alternative was not selected.

H.5.2 On-Property Disposal

Alternatives 4A and 4B involve the removal, treatment, and on-site disposal of pit wastes, soils, and associated rubble. In addition to the 1.89 hectares (4.67 acres) of scrub-shrub/persistent emergent wetlands disrupted in and adjacent to Operable Unit 1 from remedial activities, Alternatives 4A and 4B would disrupt 0.53 hectare (1.3 acres) of drainage ditch/swale wetlands for the construction of the disposal cell. A total of 2.42 hectares (5.98 acres) of wetlands would be impacted as a result of implementing Alternatives 4A and 4B. Wetland impacts would be long-term and direct from continuous equipment traffic and soil removal resulting in physical disturbance and filling of wetland areas. These long-term wetland impacts would be positive as a result of contaminant source removal. The 100- and 500-year floodplain would also be impacted in the short-term due to pit waste excavation, regrading, and associated heavy equipment operation. In addition to the removal, treatment, and disposal of Operable Unit 1 waste, reconstruction efforts would have positive impacts to the floodplains in the long term. These alternatives are not technically feasible and may not meet state acceptance.

H.5.3 Off-Property Disposal

Alternative 5A involves the removal, treatment, and off-property disposal of pit wastes, soils, and associated building rubble to the Nevada Test Site (NTS). A total of 1.89 hectares (4.67 acres) of scrub-shrub/persistent emergent wetlands would be disrupted in and adjacent to Operable Unit 1. Wetland impacts would be long-term and direct from continuous equipment traffic and soil removal resulting in physical disturbance and filling of wetland areas. These long-term wetland impacts would be positive as a result of contaminant source removal. Negative short-term impacts to the floodplain would result from pit waste removal, regrading activities, and associated heavy equipment operation. However, long-term impacts to the floodplain would be positive due to the removal, treatment, and disposal of pit wastes along with reconstruction activities employed once remedial activities have been completed. This alternative is more costly and presents a slightly higher risk to the en-route public than the representative alternative.

REFERENCES

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Parsons, 1993, "100- and 500-year Floodplain Determination Sitewide," Fernald Environmental Management Project, Cincinnati, Ohio, prepared for the U.S. Department of Energy, Fernald Field Office, Fernald, Ohio.

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APPENDIX I

OPERABLE UNIT 1
COMPREHENSIVE RESPONSE ACTION RISK EVALUATION
(CRARE)

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APPENDIX I
OPERABLE UNIT 1
COMPREHENSIVE RESPONSE ACTION RISK EVALUATION (CRARE)

The objective of the Comprehensive Response Action Risk Evaluation (CRARE) is to estimate the health risk after remediation of the Fernald Environmental Management Project (FEMP). The primary focus of the CRARE is on assessment of long-term residual risks following remediation, with a secondary quantitative assessment of the short-term transient risks of the remediation process in an effort to minimize unforeseen cumulative risks from the remediation process.

The Amended Consent Agreement signed by the U. S. Department of Energy (DOE) and the U. S. Environmental Protection Agency (EPA 1991) requires a CRARE for each of the five operable units at the FEMP. Since the CRARE assesses risk for the entire site and not all feasibility studies are performed at the same time, early CRAREs approximate risk contribution from operable units whose preferred remedial alternative is unknown by using the leading remedial alternative proposed in the Sitewide Characterization Report. Because each CRARE is based only on the information available at the time it is prepared, all but the final CRARE (Operable Unit 3) are *preliminary* evaluations of final residual risk. The primary goals of early CRARE iterations are to identify areas contributing the greatest risk and thus provide focus and direction to future data collection and analysis.

The first CRARE was submitted with the Final Operable Unit 4 FS Report (DOE 1994). For this document, the Operable Unit 1 risk contribution was approximated as the risk presented after removal of wastes from the pits, cleanup of surface soil and disposal of contaminated material in an on-site vault. This scenario is essentially identical to all likely alternatives carried through in the Operable Unit 1 FS except that in two alternatives the contaminated material will be disposed off site. A summary of the residual risks found in the Operable Unit 4 CRARE is presented as Table I-1 of this report.

On October 12, 1993, the Department of Energy proposed to EPA and OEPA that no CRARE be submitted in the Operable Unit 1 FS Report. The Operable Unit 1 FS Report would not include a

revised CRARE because the changes made to the leading remedial alternative assumed for Operable Unit 1 in the Operable Unit 4 CRARE result in negligible changes to overall site risk compared to the risks presented in the CRARE submitted with the Operable Unit 4 FS Report. Furthermore, a completely revised CRARE would be submitted with the Operable Unit 2 FS Report shortly after submittal of the Operable Unit 1 FS Report and would include all residual risks from Operable Unit 1. Therefore, any revisions of the CRARE for the Operable Unit 1 FS Report would be obsolete before EPA and OEPA complete their review. This proposal was accepted by EPA and OEPA.

TABLE I-1

SUMMARY OF ILCR AND HI FOR ALL SCENARIOS, ALL PATHYWAYS[a]

Current Land Use

RME Receptor	ILCR	HI
Groundskeeper	4.7×10^{-4}	4.2×10^{-1}
Trespassing Child	2.0×10^{-5}	7.8×10^{-2}
Off-Property Resident Farm		
Adult	1.0×10^{-4}	1.1×10^{0}
Youth	1.9×10^{-5}	1.8×10^{0}
Child	7.5×10^{-6}	3.1×10^{0}

Future Land Use With Federal Ownership

RME Receptor	ILCR	HI
Expanded Trespasser	2.7×10^{-5}	1.2×10^{-1}
Off-Property Resident Farm		
Adult	9.0×10^{-5}	1.1×10^{0}
Youth	1.6×10^{-5}	1.8×10^{0}
Child	6.6×10^{-6}	3.1×10^{0}

Future Land Use Without Federal Ownership

RME Receptor	ILCR	HI
On-Property Resident Farm		
Adult	1.1×10^{-2}	6.4×10^{1}
Youth	2.3×10^{-3}	1.0×10^{2}
Child	3.6×10^{-3}	2.4×10^{2}
Off-Property Resident Farm		
Adult	9.0×10^{-5}	1.1×10^{0}
Youth	1.6×10^{-5}	1.8×10^{0}
Child	6.6×10^{-6}	3.1×10^{0}

[a] Source: U.S. Department of Energy, 1994, "Final Feasibility Study Report for Operable Unit 4," U.S. Department of Energy, Fernald Site Office, Fernald, OH.

REFERENCES

U.S. Department of Energy, U.S. Environmental Protection Agency, 1991, "(Amended) Consent Agreement for Performance of the Fernald Remedial Investigation and Feasibility Study, U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy, 1993, "Site-Wide Characterization Report FEMP, Fernald, OH, Remedial Investigation and Feasibility Study, Draft," U.S. Department of Energy, Fernald Field Office, Fernald.

U.S. Department of Energy, 1994, "Final Feasibility Study Report for Operable Unit 4," U.S. Department of Energy, Fernald Site Office, Fernald, OH.

APPENDIX J

OPERABLE UNIT 1
OFF-SITE DISPOSAL FACILITY WASTE ACCEPTANCE CRITERIA

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LIST OF ACRONYMS

DOE	Department of Energy
DOE-NV	Department of Energy Nevada Operations Office
DOT	Department of Transportation
EPA	Environmental Protection Agency
HWMU	Hazardous Waste Management Unit
LARW	low activity radioactive waste
LDR	land disposal restriction
NORM	naturally occurring radioactive material
NTS	Nevada Test Site
OAC	Ohio Administrative Code
OU	Operable Unit
PCB	polychlorinated biphenyl
ppm	parts per million
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
TCLP	Toxicity Characteristic Leachate Procedure
TSCA	Toxic Substance Control Act
WAC	Waste Acceptance Criteria
WCO	Waste Certification Official

J.1.0 PURPOSE

This appendix summarizes the waste acceptance criteria (WAC) for both off-site facilities being considered in Alternatives 5A and 5B, the Nevada Test Site (NTS) and a permitted commercial disposal facility respectively. For the purposes of this analysis, the waste acceptance criteria of a representative commercial disposal facility near Clive, Utah are used. In addition, this appendix will provide a brief description of Operable Unit 1 (OU1) wastes and a demonstration of compliance with each facility's waste acceptance criteria.

J.2.0 GENERAL INFORMATION FOR POTENTIAL DISPOSAL FACILITIES

J.2.1 NEVADA TEST SITE (NTS)

The Nevada Test Site (NTS) is located in Nye County, Nevada, with the southeast corner lying about 105 kilometers (65 miles) northwest of the city of Las Vegas, Nevada. The NTS encompasses about 3500 square kilometers (1350 square miles), an area larger that the State of Rhode Island; dimensions vary from 46 to 56 kilometers (28 to 35 miles) in width (eastern to western border) and from 64 to 88 kilometers (40 to 55 miles) in length (northern to southern border). The NTS is surrounded on the east, north, and west sides by public access exclusion areas, which provide a buffer zone between the test areas and public lands.

NTS has been the primary location for testing the nation's nuclear explosive devices since January 1951. NTS is operated by the U.S. Department of Energy (DOE) as the on-continent nuclear weapons test site. Since 1978, NTS has also served as a major disposal facility for low-level waste generated at the facility as well as other DOE sites. On-site low-level waste is generated from three primary sources: on-site laboratories, weapons testing activities and decommissioning of retired test sites. Off-site low-level waste from other DOE sites must be prepackaged to meet NTS criteria. Both on-site and off-site waste is placed in shallow pits and trenches for disposal. Waste requiring greater confinement disposal has been placed in augured shafts. While the majority of the packaged waste is unclassified, NTS disposes of a small amount of classified low-level waste.

The FEMP has been shipping low-level waste to NTS since 1986. Shipments have historically consisted of backlog low-level waste that has accumulated since on-site disposal ceased in 1986. Shipment of additional waste streams generated from remediation of Operable Unit 1 would require revisions to the current application for disposal.

J.2.2 REPRESENTATIVE PERMITTED COMMERCIAL DISPOSAL FACILITY

The representative permitted commercial disposal facility is located on the eastern edge of the Great Salt Lake Desert, 4.8 kilometers (3 miles) west of the Cedar Mountains, near Clive, Utah. The desert area extends for approximately 96 kilometers (60 miles) from the Nevada border on the west to

a series of north-south-trending mountain ranges on the east. A 16-kilometer (10-mile) area of state-owned land surrounds the site; since the area is extremely remote from urbanized centers, it is rarely used for recreational purposes.

On February 2, 1988, the representative permitted commercial disposal facility received its license for the disposal of naturally occurring radioactive material (NORM) and, later, for low activity radioactive waste (LARW) and mixed waste. The site meets all the requirements of 40 CFR 192 and Utah Radiation Control Rules of R447-25, which conform to 10 CFR 61. The facility also holds a Resource Conservation and Recovery Act (RCRA) Part B Permit from the Utah Division of Solid and Hazardous Waste. The permit allows the facility to accept, treat and dispose solid mixed waste that require stabilization in order to meet Land Disposal Requirements (LDRs).

J.3.0 OPERABLE UNIT 1 WASTE STREAMS

Waste located within Operable Unit 1 is considered depleted low-level radioactive waste, as defined in 10 CFR Part 61, i.e., waste that contains radioactivity and is not classified as high-level waste, spent nuclear fuel, transuranic waste, uranium mill tailings, mixed waste or 11e(2) by-product material. Low-level waste in Operable Unit 1 includes the material in Waste Pits 1, 2, 3, 6, the Burn Pit and the Clearwell.

Waste in Waste Pits 4 and 5 is currently defined as low-level mixed waste, i.e., low-level waste that is mixed with RCRA hazardous waste. Waste Pit 4 was determined to be a hazardous waste management unit (HWMU) in 1984 based on a process knowledge determination that barium chloride was disposed in the pit. Barium can be a RCRA characteristic waste (D005). Analytical results from sampling events conducted since 1984 do not support the determination--samples did not fail EP-Toxicity or TCLP for barium (see Operable Unit 1 Remedial Investigation Report, 1994). However, waste from Waste Pit 4 will be handled as mixed waste until post-treatment analyses indicate the waste does not exhibit any RCRA characteristics. Post-treated waste from Waste Pit 4 that does not exhibit RCRA characteristics will be considered low-level radioactive waste.

Waste Pit 5 was originally (September 1991) declared a HWMU because it received wastewaters that contained a listed hazardous waste. However, in May 1993, it was determined that the wastewaters met the conditions of the mixture rule exclusion in Ohio Administrative Code (OAC) 3745-51-03(A)(2)(e). At that time, the FEMP agreed that, due to the uncertainty of the characteristics of wastewater treatment sludge, Waste Pit 5 would continue to be classified as a HWMU based on the possible management of RCRA characteristic wastes. Therefore, waste from Waste Pit 5 will be handled as mixed waste until post-treatment analyses indicate the waste does not exhibit any RCRA characteristics. Post-treated waste from Waste Pit 5 that does not exhibit RCRA characteristics will be considered low-level radioactive waste. There are no listed wastes in Operable Unit 1.

J.4.0 WASTE ACCEPTANCE CRITERIA - NEVADA TEST SITE (NTS)

The DOE's Nevada Operations Office (DOE-NV) establishes NTS waste acceptance criteria and requirements for waste certification and transfer under document number NVO-325. The criteria in NVO-325 apply to all defense radioactive wastes received at NTS for storage or disposal. Waste acceptance criteria are consistent and in compliance with DOE Order 5820.2A and all applicable federal, state, and local regulatory requirements. NTS may only accept waste from generators designated by DOE-HQ and approved by DOE-NV.

Prior to shipping waste to NTS, the generator must complete the application process and obtain approval from DOE-NV to ship. The application includes general items such as facility location, operating information and organizational charts, plans for waste handling and traceability, waste minimization plan, and funding, as well as specific information on the waste streams to be disposed at the facility. Once the application is approved, changes or additions to the application can be made. In addition, DOE-NV will conduct annual audits on the shipping facility to ensure compliance with their waste acceptance criteria.

Tables J.6-1 through J.6-2 provide detailed information on NTS waste acceptance criteria; a discussion of FEMP compliance with the requirements is also provided in the tables.

Waste Characterization

As part of the NTS waste acceptance criteria, a generator is required to demonstrate compliance with 40 CFR 261 through 268 and to provide information required under DOE Order 5820.2A for a performance assessment of the waste disposal site.

NTS will not accept wastes regulated as hazardous under RCRA or as wastes containing 50 ppm or more of polychlorinated biphenyls (PCBs) under the Toxic Substance Control Act (TSCA). Process knowledge and/or sampling and analysis may be used to demonstrate compliance with these requirements. NTS requires the generator to submit a sampling and analysis plan for approval prior

to shipping waste to the facility. Detailed guidance on preparation of the plan is provided in NVO-325.

Waste Stream Information

NTS requires the generator to provide specific information for each waste stream that will be disposed at the facility. Physical data, such as particle size, moisture content, and waste form, and chemical data, such as radiological and hazardous, must be provided for each waste stream being offered for disposal. The specific information requested is presented in Tables J-1 through J-4. In addition, the generator is required to submit a three-year forecast summary for each waste stream to be shipped. The forecast must include information such as the waste stream, container type and size, number of shipments, and expected total volume to be shipped.

Waste Certification

NTS requires generators to develop a waste certification program to ensure all waste acceptance criteria are met. The program must be documented in the Waste Certification Program Plan, which defines the generator's quality assurance (QA) program as it applies to waste certification and characterization. NTS requires the generator to designate a Waste Certification Official (WCO) to certify that all waste acceptance criteria are met prior to shipment. The generator may also designate a package certifier, who must be independent of waste generation activities, and who certifies that the package to be shipped and its contents meet Department of Transportation (DOT), U.S. Environmental Protection Agency (EPA), and DOE-NV requirements.

J.5.0 WASTE ACCEPTANCE CRITERIA FOR A REPRESENTATIVE PERMITTED COMMERCIAL DISPOSAL FACILITY

The representative permitted commercial disposal facility confirms compliance with its waste acceptance criteria through an application process. Prior to shipping waste to the representative permitted commercial disposal facility, the generator is required to complete several forms as appropriate: low-activity profile sheet (EC-0200), physical properties form (EC-0500), radiological evaluation (EC-0650), and/or a mixed waste profile form (EC-0175). Each of these forms requests specific information about the waste stream and establishes sampling and analysis requirements. Once a generator has completed the appropriate forms, submitted analytical lab results and received facility approval, shipments of waste may begin.

The radioactive materials license for the facility also places restrictions on the amount of waste the facility may have in active processing, maximum quantities of special nuclear material that may be handled, and maximum concentrations of mixtures of radionuclides that may be present in each waste stream. The representative permitted commercial disposal facility's waste acceptance criteria ensure compliance with the requirements of its radioactive and hazardous waste licenses.

Waste Characterization

The representative permitted commercial disposal facility's radioactive material license, granted by the Utah Department of Environmental Quality, Division of Radiation Control, establishes maximum average concentrations permissible in the waste that is to be disposed. Concentrations are considered by individual isotope. If the waste is natural or depleted uranium, it must be under a given activity level.

The representative permitted commercial disposal facility is also permitted by the Utah Bureau of Solid and Hazardous Waste for disposal of "mixed" waste. Hazardous wastes on the permit include D-characteristic wastes, and most F-, P-, U-, and K-listed wastes. The facility is not permitted to accept F-listed dioxins.

The waste profile forms that must be completed prior to shipment provide the facility with the information needed to ensure compliance with these requirements. The generator is also required to send a sample of the waste to the facility prior to shipment. The facility uses this sample to verify the waste meets all waste acceptance criteria.

Waste Certification

The representative permitted commercial disposal facility is responsible for waste certification under the terms of its license. The facility maintains a waste characterization plan that establishes the procedures for characterizing, sampling, and accepting incoming shipments at the facility. The first step in the plan is waste generator characterization as described above and in Tables J-1 through J-4. The second step requires the facility to sample and analyze the incoming waste shipments for radiological and chemical screening analyses. The facility then accepts or rejects the shipment based on the analytical results and the waste acceptance criteria. If the waste is accepted, final disposition takes place.

J.6.0 TABLES DEMONSTRATING COMPLIANCE

Tables J.6-1 through J.6-4 provide specific waste acceptance requirements for NTS and the representative permitted commercial facility. The tables identify specific parameters each facility will use to determine if incoming waste is acceptable for disposal. The tables also indicate how Operable Unit 1 waste will comply with waste acceptance requirements.

TABLE J.6-1

GENERAL CRITERIA

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Packaging	Packaging must be strong and tight and of a type used specifically for shipping low activity LLRW and low specific activity waste. Type A packaging must meet the requirements of 49 CFR 173.411 and 49 CFR 173.412. Type A package must also meet certification requirements of MLM-3245. Type B packaging must meet the requirements of 10 CFR 71.	Licensed material shall not be disposed of unless concentrations of radionuclide are appropriately homogeneous with the physical form of the waste. Bulk shipment of waste is preferred. DOT packaging requirements are applicable.	The waste shipment program for NTS can be easily developed for compliance with the referenced requirements. Shipment to the representative permitted commercial disposal facility will be in bulk by rail. Containerization in bags and rail car hard cover will meet DOT packaging requirements.
Bulk	Only low activity LLRW will be accepted in bulk. Bulk low level LLRW will have to be shipped in closed transport vehicles. Bulk waste to be contained such that RWMS personnel can off load waste without contaminating personnel or equipment. Bulk waste must meet the requirements of 49CFR173.425. Bulk waste containers may be returned to the waste generator. All MW must be packaged.	Low activity LLRW and MW may be shipped as volumetric bulky materials or structural debris. Representative permitted commercial disposal facility requires that the optimum moisture content (determined by the Standard Proctor test (ASTM D-698).	Waste shipped to NTS would not be transported in sealed containers. Waste shipped to permitted commercial facility would be transported in bulk and would meet the moisture content requirement (waste is to be dried prior to shipment).
Criticality	The quantity of fissile material within a package shall be limited so that an infinite array of such packages will remain subcritical. The quantity of fissile material shall be determined on the basis of a waste specific nuclear safety analysis (49CFR173.451).	Representative permitted commercial disposal facility limits on radionuclide concentration in wastes preclude criticality concerns.	The radiological characteristics of the wastes as documented by the Operable Unit 1 RI preclude criticality concerns on a per shipment basis.
Decay Heat	The quantity of radioactive material in a package or waste matrix shall be limited to the extent that the effects of nuclear decay heat will not adversely affect the physical integrity of a package or the chemical stability of its contents or the waste matrix generally (49CFR173.442).	Representative permitted commercial disposal facility limits on radionuclide concentration in wastes preclude criticality concerns.	The radiological characteristics of the wastes as documented by the Operable Unit 1 RI preclude criticality and decay heat concerns on a per shipment basis.
Radiation	The external radiation levels for packages shall not exceed 200 mrem/hr on contact during handling, shipment, and disposal (49CFR173.441). DOT regulatory exceptions will be acceptable on a case by case basis. Type B containers that require remote handling will be addressed on a case by case basis.	DOT requirements are applicable.	Radiation level for waste packages are limited to 200 mrem/hr at contact. The packages (including rail cars) will be filled accordingly. A waste shipment certification program shall be developed accordingly.

TABLE J.6-1
(Continued)

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
External Contamination	Packages shall be within DOT contamination limits upon receipt at NTS (49CFR173.443).	DOT requirements are applicable for incoming vehicles or equipment. Vehicles or equipment shall not be released from the facility for unrestricted use if removable contamination exceeds 10 dpm/cm^2 or 2 dpm/cm^2.	Waste will be shipped such that all DOT requirements are met. A waste shipment certification program shall be developed accordingly.
Activity	Transport requirements for low specific activities radioactive materials shall be met for strong, tight packages (49CFR173.421, 49CFR173.425). Where applicable activity limits for Type A and Type B packages shall be met (49CFR173.431).	Allowable representative permitted commercial disposal facility radionuclide activity levels are lower than DOT allowable.	Waste shipped to NTS will meet all DOT packaging requirements. Representative permitted commercial disposal facility activity levels will be met for shipment to that facility which will preclude DOT concerns.
Multiple Hazards	Shall be packaged according to the most severe level of hazard (49CFR173.2).	DOT requirements are applicable.	Waste will be shipped such that all DOT requirements are met.
Marking	All waste received from off-site generators shall be marked and labeled (49CFR172). MW packages of 110 gallon or less are to be marked in accordance with 49CFR262.32(b). Chemically hazardous material shall be so labeled (49CFR173.2). All packages shall be marked with a unique package identifier. Bar coding denoting shipment, package, and waste stream identification is required. Bulk waste shipments must be accompanied by appropriate waste identification documentation.	DOT requirements are applicable.	All waste shipments will meet DOT requirements for marking and labelling.

TABLE J.6-2

PACKAGE SPECIFIC CRITERIA

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Closure	The package closure shall not be breached under normal handling conditions and shall not be the weakest structural element in the package.	DOT requirements are applicable.	OU1 wastes may be shipped as low-level; shipments to NTS would meet DOT container requirements; shipments to representative permitted commercial disposal facility would be transported via bulk and would also meet DOT requirements for bulk shipping.
Strength	Packages (contents considered) shall be capable of supporting a uniformly distributed load of 4,000 psf on any of the surfaces. (Sea/land containers, steel drums and bulk waste are exempted from this requirement.)	DOT requirements are applicable.	OU1 wastes may be shipped as low-level; shipments to NTS would meet DOT container requirements; shipments to representative permitted commercial disposal facility would be transported via bulk and would also meet DOT requirements for bulk shipping.
Handling	All waste packages shall be provided with permanently attached skids, cleats, offsets, rings, handles or other auxiliary lifting devices to allow handling by means of forklifts, cranes, or similar equipment. Lifting rings and other auxiliary lifting devices on the package must not inhibit stacking of the packages. Lifting devices must have a 5:1 safety factor based on the device material's ultimate strength.	DOT requirements are applicable.	Shipments to permitted commercial disposal facility would be transported via bulk and would also meet DOT requirements for bulk rail shipping. Because the FEMP is currently shipping waste to NTS, compliance with the handling requirements has been implemented in pre-shipping handling; and with the shipping container requirements.

TABLE J.6-2
(Continued)

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Size	DOE/NV recommends that 4- X 4- X 7-A or 4- X 2- X 7-A (width, height, length) boxes or 55-gallon steel drums be used. Other size containers are acceptable with approval of DOE/NV.	Bulk or packaged waste is permitted. Unpackaged debris shall be less than 10 inches in at least one dimension and no longer than 8 feet in any other dimension.	Shipments to representative permitted commercial facility would be transported via bulk. Treatment of the waste prior to shipment, i.e., crushing/shredding, will ensure compliance with the particle size requirement. Because the FEMP is currently shipping waste to NTS, compliance with the handling requirements has been implemented in pre-shipping handling; and with the shipping container requirements.
Weight	NTS imposes limits of 9,000 lbs. per box and 1,200 lbs. per 55-gallon drum. Packages exceeding these limits require crane handling and if approved by DOE/NV must be shipped in removable-top or removable side trailers. Packages in excess of 9,000 lbs. will result in additional disposal cost to the waste generator.	DOT requirements are applicable.	Shipments to representative permitted commercial disposal facility would be transported via bulk and would also meet DOT requirements for bulk rail shipping. Because the FEMP is currently shipping waste to NTS, compliance with the handling requirements has been implemented in pre-shipping handling; and with the shipping container requirements.

TABLE J.6-2
(Continued)

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Void Space	Waste packages shall utilize package volume in such a fashion as to insure matrix stability (reduce the possibility of substance) and efficiency (maximum amount of waste in minimum volume).	Void space in packages should be minimized.	Shipments to representative permitted commercial disposal facility would be transported via bulk, therefore void space requirements for containers do not apply. Because the FEMP is currently shipping waste to NTS, compliance with the handling requirements has been implemented in pre-shipping handling; and with the shipping container requirements.
Nonstandard Type A Packaging	Use of Type A packaging not evaluated under the DOE Type A Package Certification Program (MLM-3245, DOT 7A Type A Certification Document) will not be permitted.	DOT requirements are applicable.	OU1 wastes may be shipped as low-level; shipments to NTS would meet DOT container requirements - waste would not be shipped in packaging not evaluated under the DOE program; shipments to representative permitted commercial disposal facility would be transported via bulk and would also meet DOT requirements for bulk shipping.

TABLE J.6-2
(Continued)

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Packaging Protection	Each waste package shall be prepared for shipment so as to minimize damage during transit. Preshipment storage shall be controlled to avoid adverse effects of weather or other factors on the containment capability of the waste packaging during handling, storage, and transport. The accumulation of moisture on or in packages prior to arrival at the NTS shall be avoided. Each waste container shall be provided with tamper indication devices once all certification actions have been taken.	DOT requirements are applicable.	There will be no preshipment storage transport to the representative permitted commercial disposal facility. Because the FEMP is currently shipping waste to NTS, compliance with the handling requirements has been implemented in pre-shipping handling; and with the shipping container requirements.

TABLE J.6-3

WASTE FORM CRITERIA

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Transuranics	LLRW must have a transuranic nuclide concentration not greater than 100 mCi/g. Transuranic waste must meet all NTS acceptance criteria. Transuranic waste exceeding these requirements is accepted at NTS only for interim storage prior to shipment to the WIPP facility. Certification that waste form meets WIPP minimum waste acceptance criteria is required.	Acceptable activity limits preclude acceptance of transuranic waste.	The analytical data presented in the RI confirms that the representative volume of waste in Operable Unit 1 does not meet the definition of a transuranic waste.
Hazardous Waste	Low level waste offered for disposal at NTS waste management sites shall not exhibit any characteristics of or be listed as hazardous waste as identified in 40CFR261.	Mixed waste and hazardous wastes are accepted by representative permitted commercial disposal facility.	OU1 does not contain any listed RCRA wastes. Post-treated waste are not expected to exhibit any hazardous characteristics. This is based on two factors. First, waste drying would reduce any characteristic volatile organic concentrations to below regulatory levels. Second, existing analytical results have not indicated characteristic concentrations of other contaminants, including metals that exceed regulatory thresholds. Therefore, no RCRA listed or characteristic wastes will be disposed of in either facility. Sampling and analysis will be conducted during post-treatment to ensure compliance with this requirement.
Free Liquids	Minor liquid residue remaining in well-drained containers, or liquids which have been entrapped, are acceptable. In no case shall free liquid content exceed 0.5 percent by volume. Use of Method 9095 (Paint Filter Test - EPA Publication SW-846) may be required to demonstrate compliance with this requirement.	Radioactive Waste containing liquid shall not be accepted for disposal except as provided by the groundwater discharge permit number UGW 450005, issued by the Executive Secretary of the Utah Water Quality Board.	OU1 waste will be treated (dried) prior to shipment. Free liquid requirements for NTS and representative permitted commercial disposal facility will be met by using this treatment method.
Particulate	Fine particulate wastes shall be immobilized so that the waste package contains no more than one weight percent of less than 10-micrometer-diameter particles or 15 weight percent of less than 200 micrometer diameter particles, with radioactive contamination. When immobilization is impractical, the waste packaging shall include a sealed liner and be over packed.	DOT requirements are applicable.	DOT containerization requirements for bulk shipment of LLRW to the representative permitted commercial disposal facility will be met by use of hard covers on the rail cars or bags. Sealed boxes will be used for disposing wastes at NTS.

TABLE J.6-3
(Continued)

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Gases	Radioactive gases shall be stabilized or absorbed so that pressure in the waste packaged does not exceed 1.5 atmosphere at 20°C. Compressed gases (49CFR173.300) will not be accepted for disposal.	Not accepted for disposal.	These requirements do not apply to OU1 waste because the RI data indicates that gases will not be present in significant amounts.
Stabilization	Where practical, waste shall be treated to reduce volume and provide a more physically and chemically stable waste form. Wastes shall not significantly react with the packaging during normal storage, shipping, and handling time.	No direct requirement.	For both disposal facilities the wastes will be dried prior to shipment. This will reduce the volume of the waste by removing interstitial pore water and will also provide for a more stable waste.
Etiologic Agents	LLRW containing pathogens, infectious wastes, or other etiologic agents (49CFR173.386) will not be accepted for disposal.	LLRW containing pathogens, infectious wastes, or other etiologic agents (49CFR173.386) will not be accepted for disposal.	These requirements do not apply to OU1 wastes because the wastes do not contain pathogens or infectious wastes.
Chelating Agents	LLRW containing chelating or complexing agents at concentrations greater than one percent by weight will not be accepted.	Identification of wastes containing more than 0.1% by weight of chelating agents.	These requirements do not apply to OU1 wastes because they do not contain chelating agents.
Bulk	Shall be solid and meet the requirements of 49CFR173.425(c)(3). Bulk MW will not be accepted for disposal in Area 3.	Bulk low activity LLRW is the preferred waste form for disposal.	All waste offered for shipment meets the definition of solid waste; and will meet all DOT requirements for shipping by bulk rail for the representative permitted commercial disposal facility or by containers on truck for NTS.

TABLE J.6-4

MIXED WASTE ACCEPTANCE CRITERIA

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Treated Waste	MW must receive any required treatment prior to shipping to NTS. Mixed waste treatment must follow EPA approved methods, and must be in compliance with 40CFR268.	Treated waste may be accepted. Non-radioactive hazardous waste must not be mixed with radioactive waste.	RCRA characteristic waste will meet treatment standards as required under 40 CFR 268 prior to disposal off site. There are no listed wastes in Operable Unit 1.
Asbestos	Radioactively contaminated asbestos capable of giving off friable asbestos dust must be wetted with water and surfactant (adsorbent additive required to control free liquid) and stored in double plastic bags having a combined wall thickness of at least 6 mil. The plastic bags must be overpacked in leak related metal or wood containers. Sea/land containers containing radioactive asbestos will be considered on a case by case basis. Any regulated asbestos waste must be segregated into a separate stream.	Waste regulated as asbestos may not be accepted by the facility.	None of the waste in OU1 is regulated as asbestos waste. Although a small portion of OU1 waste may contain asbestos, the total is less than 1% of the total volume of waste which is the regulatory threshold.
Radioactive Waste	Radioactive waste must be treated in accordance with 40CFR268 Subpart D as applicable. Explosives, pyrophoric materials, or high-heat generators are not acceptable for MW disposal. LLRW containing explosive or pyrophoric material in a form that may spontaneously explode or combust if the container is breached will not be accepted. Cyanide- and sulfide-bearing wastes in concentrations greater than 10 percent by weight (Cn^- or S^-) will not be accepted. (Potentially incompatible waste must be identified by the most appropriate compatibility group listed in 40CFR264, Appendix V, if accepted for disposal.)	Radioactive waste acceptance criteria must be met to be accepted by the disposed facility.	The NTS requirements do not apply to Operable Unit 1 wastes because they do not demonstrate any of the characteristics referenced in the criteria. The waste acceptance criteria for the representative permitted commercial disposal facility will be achieved by drying.
Liquids	Mixed waste must not have free liquids and may be required to demonstrate this requirement by implementation of EPA Test Method 9095, in EPA Publication No. SW-846.	Radioactive waste containing liquid shall not be accepted for disposal except as provided by the groundwater discharge permit number UGW 450005, issued by the Executive Secretary of the Utah Water Quality Board.	OU1 waste will be treated (dried) prior to shipment. Free liquid requirements for NTS and representative permitted commercial disposal facility will be met by using this treatment method.

TABLE J.6-4
(Continued)

Requirements	NTS	Representative Permitted Commercial Disposal Facility	Compliance with Requirements
Waste Generator	All DOE defense facilities are eligible to utilize the NTS as a disposal or storage site provided NTS acceptance criteria are satisfied.	Representative permitted commercial disposal facility does not accept low-activity waste generated outside the region comprised of the party states to the Northwest Interstate Compact with Alaska, Hawaii, Idaho, Montana, Oregon, Utah, and Washington unless the provisions of Article IV and V of the Compact are met.	Fernald is a DOE site eligible to use the NTS for disposal. Fernald has satisfied the provisions of Article IV and V of the Northwest Interstate Compact.
Documentation	Extensive documentation, package labeling and permitting is required, see NVO-325 for details.	Specific forms must be filled out which describe waste stream information and waste physical properties.	All documentation will be completed prior to shipment of waste for off-site disposal
Analytical Data	Documentation and analysis of waste streams is required, see NVO-325 for details.	Analytical results should be submitted. Utah or CLP certified laboratories may be used. Samples of waste must be sent to representative permitted commercial disposal facility.	Sampling and analysis requirements and frequencies will be completed prior to shipment of waste for off-site disposal
Polychlorinated Biphenyls (PCBs)	PCB-contaminated waste will not be accepted for disposal at NTS unless the PCB concentration meets municipal solid waste disposal levels (40CFR761.60).	PCB-contaminated waste will not be accepted for disposal at representative permitted commercial disposal facility unless PCB concentrations meet municipal solid waste disposal levels.	These requirements do not apply to OU1 waste, because the RI has documented that PCBS in the waste pits do not exceed cumulative concentrations of 50 ppm (regulatory threshold).

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