

APPENDIX K

Detailed Cost Estimate

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**Feasibility Study for C Block Quarry
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of Alternatives**

C Block Quarry Area Alternatives		Duration	Non Discounted Cost		
			Soil		
			Capital Cost	O&M Cost	Total
1	No Action	0	\$0	\$0	\$0
2	Surficial ACM Removal and LUCs	30 yr	\$23,266	\$85,269	\$108,534
3	Excavation and Offsite Disposal – Attain Unrestricted (Residential) Land Use	<1 yr	\$390,224	\$0	\$390,224

Notes:

1. The base year of comparison and cost data will be CY2017.

2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

**Feasibility Study for C Block Quarry
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of AOC Areas and Volumes**

Media	Treatment Interval (ft bgs)	Surface Area (ft ²)	In-situ		In-situ with Constructability ^a		Ex-situ ^{a,b}	
			Volume (ft ³)	Volume (yd ³)	Volume (ft ³)	Volume (yd ³)	Volume (ft ³)	Volume (yd ³)
Soil	0-2	13,654	27,308	1,011	34,135	1,264	40,962	1,517

^a Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in-situ volume is increased by 25% for a constructability factor.

^b Includes 20% swell factor.

Feasibility Study for C Block Quarry
Alternative 2 - Surficial ACM Removal and LUCs
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
<u>Capital Cost</u>			
<u>Site Work</u>			
Site Area	sf	550	Assumes 0.5 ft average depth.
Civil Survey	day	0.5	Survey AOC areas and set monuments. RSMMeans 017123131100.
Civil Survey	\$/day	941	
As Built Drawings	hours	4	Develop plat map for incorporation into the Base Master Plan.
As Built Drawings	\$/hr	70	
Install Signs on Post	ea	2	Assume warning signs installed at access points. RSMMeans 028907000100 & 1500. Add 25% for custom letters.
Install Signs on Post	\$/ea	209	
<u>Removal of Surficial Asbestos-Containing Material</u>			
Includes excavation of surficial asbestos-containing material. Assume approximately 10 cy ex situ.			
Surficial Asbestos-Containing Material Waste Volume (Ex situ)	cy	10	Includes ACM volume to be transported and disposed.
Volume to Weight Conversion	tons/cy	1.00	tons/cy ACM conversion assuming ACM with limited soils.
Mass of ACM Removed	tons	10	Includes ACM mass to be transported and disposed.
Mobilization/Demobilization	ls	1,000	Includes mob/demob of personnel and preparing submittals.
Remove Surficial Asbestos-Containing Material	day	1	Includes 2 labors with mini excavator, truck, and small tools for one day to remove surficial asbestos and place in container.
	\$/day	1,418.00	
Roll-off Mob, Liner, and Haul Fee	ea	1	Includes roll-off box spot fee, liner, and hauling fee. Vendor quote.
	\$/ea	815.0	
ACM Disposal	ton	10	Based on disposal at American Landfill, Waynesburg, Ohio.
	\$/ton	46.00	
Asbestos Hazard Evaluation Specialist Labor	hrs	24.00	Includes oversight and monitoring
	\$/hr	90	
<u>O&M Cost (Years 0 to 30)</u>			
<u>CERCLA Reviews</u>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years. Includes site inspection for disturbance/erosion and 5-Year Review Report. Assume 80 hours/review @ \$90/hr. Add \$1,500 in travel and miscellaneous expenses.
CERCLA 5-Year Reviews	\$/event	8,700	

Feasibility Study for C Block Quarry
Alternative 2 - Surficial ACM Removal and LUCs
Cost Estimate

CAPITAL COST **\$23,266**

Activity (unit)	Quantity	Unit Cost	Total
Site Work			
Civil Survey (day)	0.5	\$941.00	\$471
As Built Drawings (hrs)	4	\$70.00	\$280
Install Signs on Post (ea)	2	\$209.00	\$418
Removal of Surficial Asbestos-Containing Material			
Mobilization/Demobilization (ls)	1	\$1,000.00	\$1,000
Remove Surficial ACM Waste (day)	1	\$1,418.00	\$1,418
Roll-off Mob, Liner, and Haul Fee (ea)	1	\$815.00	\$815
ACM Disposal (tons)	10	\$46.00	\$460
Asbestos Hazard Evaluation Specialist Labor (hrs)	24	\$90.00	\$2,160
Subtotal			\$7,022
Design		100%	\$7,022
Office Overhead		10%	\$702
Field Overhead		25%	\$1,755
Subtotal			\$16,501
Profit		6%	\$990
Contingency		35%	\$5,775
Total			\$23,266

OPERATION AND MAINTENANCE **\$85,269**

Activity (unit)	Quantity	Unit Cost	Total Cost
CERCLA Reviews			
CERCLA 5-Year Reviews (ea)	6	\$8,700	\$52,200
Subtotal O&M			\$52,200
Design		15%	\$7,830
Office Overhead		5%	\$2,610
Field Overhead		15%	\$7,830
Subtotal			\$70,470
Profit		6%	\$4,228
Contingency		15%	\$10,571
Total			\$85,269

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost) **\$108,534**

Feasibility Study for C Block Quarry
Alternative 3 - Excavation and Offsite Disposal – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
<u>Capital Cost</u>			
<u>Additional Site and Waste Profile Characterization</u>			
Site and Waste Profile Samples	ea	32	Includes 30 samples collected for asbestos delineation and two samples collected for waste profiling (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs). Includes sampling labor. Assumes 1 sampling technician at 8 hours/day for 2 days. 1 truck x \$90/day. Add \$50 for gas. Includes 2 labors with mini excavator, truck, and small tools to remove surficial asbestos and place in container. Reference ECHOS 33 02 0401/0402 for disposable sampling and decontamination materials. Analyze samples for asbestos in soil (32 @ \$35) and waste profile (2 @ \$706) .
Sampling Labor	hrs	16	
Sampling Labor	\$/hr	90	
Truck Rental / Gas	\$/event	230	
Dig Test Trenches	day	2	
Dig Test Trenches	\$/day	1418	
Sample Materials	ea	32	
Sample Materials	\$/ea	22	
Analytical Cost	\$/event	2,532	
<u>Site Work</u>			
Site Area	sf	13,654	Survey AOC for land use controls, limits of excavation, record drawings. RSMean 017123131100. Develop record drawings. Assume trees/brush cleared, chipped, and left onsite. RSMean 022302000200. Clear and chip medium trees to 12" dia. Includes excavation of the AOC areas based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor. Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor. In situ soil conversion assuming ACM primarily in soils. Includes soil mass to be transported and disposed.
Civil Survey	day	1.0	
Civil Survey	\$/day	941	
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	
Clearing	acre	0.25	
Clearing	\$/acre	5,908	
<u>Soil Excavation</u>			
Soil Excavation Volume (In situ)	cy	1,264	Includes mob/demob of excavation equipment and preparing submittals.
Soil Excavation Volume (Ex situ)	cy	1,517	
Volume to Weight Conversion	tons/cy	1.50	
Soil Excavation Mass	tons	1,896	
Soil Excavation Surface Area	sf	13,654	
	ls	5,000	
<u>Mobilization/Demobilization</u>			
<u>Excavate Soils</u>			
	days	7	Includes 1 cy excavator, 3-20 cy dump trucks, 1 O.E., 3 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for asbestos packaging, shallow excavations, and security/ S&H requirements. Assume soils are direct loaded into trucks. Average 200 cy/day.
	\$/day	6,832	
<u>Standby Time</u>			
	day	3	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
	\$/day	900	
<u>Offsite Disposal</u>			
	tons	1,896	Based on shipping waste to American Landfill, Waynesburg, Ohio approximately 80 mi RT. Assume 3 hrs/cycle for transportation.
	\$/ton	47.56	

**Feasibility Study for C Block Quarry
Alternative 3 - Excavation and Offsite Disposal – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions**

Key Parameters and Assumptions:

Item	Unit	Value	Notes
<u>Confirmational Sampling & Analysis</u>			
Confirmation Samples	ea	10	Includes 10 samples using incremental sampling methodology (ISM).
Sampling Labor	hrs	16	Includes confirmation sampling labor. Assumes 1 sampling technician at 8 hours/day for 2 days.
Sampling Labor	\$/hr	90	
Truck Rental / Gas	\$/event	230	1 truck x \$90/day. Add \$50 for gas.
Confirmation Sample Materials	ea	10	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Confirmation Sample Materials	\$/ea	22	
Analytical Cost	\$/event	850	Analyze samples for hexavalent chromium (10 @ \$50) and asbestos soil (10 @ \$35).
Asbestos Certification and Report	\$/event	2,000	Included certified asbestos inspector certification and report.
Data Management	hrs	10	Data validation and management
Data Management	\$/hr	90	
<u>Restoration</u>			
Native Soil Backfill	cy	1,517	Includes native soil backfill. Add 25% for certified clean soil and reduced productivity from security and safety requirements. Borrow, topsoil or loam, 3/4 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted. RSM312323157050.
Native Soil Backfill	\$/cy	32.40	
Seeding, Vegetative Cover	MSF	22	Seeding with mulch and fertilizer. Assume 0.5 acres are revegetated for excavation areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	56.37	
SWPPP Inspections	hrs	16	Assume 4 hrs per week for 4 weeks.
SWPPP Inspections	\$/hr	60	
<u>Plans and Reports</u>			
Corrective Action Completion Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	80	

Feasibility Study for C Block Quarry
Alternative 3 - Excavation and Offsite Disposal – Attain Unrestricted (Residential) Land Use
Cost Estimate

CAPITAL COST

\$390,224

Activity (unit)	Quantity	Unit Cost	Total
<u>Additional Site Characterization</u>			
Sampling Labor (hrs)	16	\$90.00	\$1,440
Truck Rental / Gas (event)	1	\$230.00	\$230
Dig Test Trenches (day)	2	\$1,418.00	\$2,836
Confirmation Sample Materials (ea)	32	\$22.00	\$704
Sample Analysis (event)	1	\$2,532.00	\$2,532
<u>Site Work</u>			
Civil Survey (day)	1.0	\$941.00	\$941
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.25	\$5,908.00	\$1,477
<u>Soil Excavation</u>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	7	\$6,832.00	\$47,824
Standby Time (day)	3	\$900.00	\$2,700
Offsite Disposal (ton)	1,896	\$47.56	\$90,174
<u>Confirmational Sampling & Analysis</u>			
Sampling Labor (hrs)	16	\$90.00	\$1,440
Truck Rental / Gas (event)	1	\$230.00	\$230
Confirmation Sample Materials (ea)	10	\$22.00	\$220
Sample Analysis (lot)	1	\$850.00	\$850
Asbestos Certification and Report (lot)	1	\$2,000.00	\$2,000
Data Management (hrs)	10	\$90.00	\$900
<u>Restoration</u>			
Native Soil Backfill (cy)	1,517	\$32.40	\$49,151
Seeding, Vegetative Cover (MSF)	22	\$56.37	\$1,240
SWPPP Inspections (hrs)	16	\$60.00	\$960
<u>Plans and Reports</u>			
Corrective Action Completion Report (ea)	200	\$80.00	\$16,000
Subtotal			\$229,409
Design		15%	\$34,411
Office Overhead		5%	\$11,470
Field Overhead		15%	\$34,411
Subtotal			\$309,702
Profit		6%	\$18,582
Contingency		20%	\$61,940
Total			\$390,224

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