Remedial Design/Remedial Action Work Plan for the 200 Area Plutonium and Cesium Sites (200-CW-5, 200-PW-1/3/6)

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US. Environmental Protection Agency

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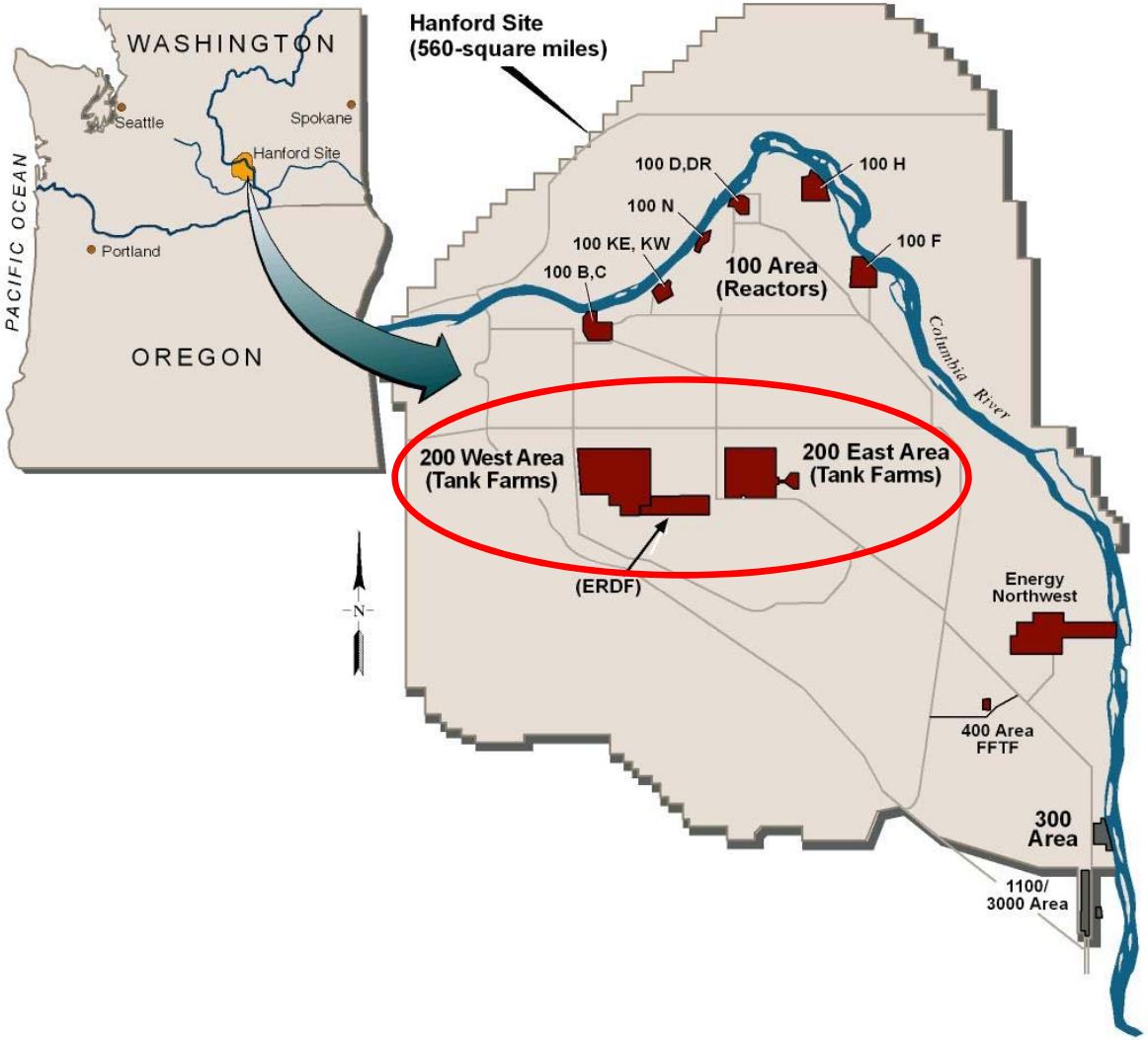
Remedial Design/ Remedial Action

- Remedial design (RD) is the phase in Superfund site cleanup where the technical specifications for cleanup remedies and technologies are designed.

- Remedial action (RA) follows the remedial design phase. It involves the actual construction or implementation phase of Superfund site cleanup.

- The RD/RA is based on the specifications described in the Record of Decision (ROD).

https://www.epa.gov/superfund/superfund-remedial-design-remedial-action


WASHINGTON
Seattle
Spokane
Hanford Site
PACIFIC OCEAN
Portland
OREGON
Hanford Site
(560-square miles)
100 D,DR
100 H
100 N
100 KE, KW
100 F
100 B,C
100 Area
(Reactors)
Columbia River
200 West Area
(Tank Farms)
200 East Area
(Tank Farms)
(ERDF)
N
Energy
Northwest
400 Area
FFTF
300
Area
1100/
3000 Area

Background

- Soils, subsurface disposal structures, 2 settling tanks, and associated pipelines

Table 2. Summary of Waste Sites Assigned to Each Waste Group

Operable Unit	Waste Site	Waste Group	Primary Contaminants
200-CW-5	216-Z-1D Ditch, North and South 216-Z-11 Ditch 216-Z-19 Ditch 216-Z-20 Tile Field UPR-200-W-110 Unplanned Release (200-W-207-PL Pipeline)	Z-Ditches	plutonium 239/240, americium-241, cesium-137, radium-226, strontium-90, boron, mercury, PCBs
200-PW-1	216-Z-1A Tile Field 216-Z-9-Trench 216-Z-18 Crib (200-W-174-PL Pipeline) (200-W-206-PL Pipeline)	High-Salt	plutonium 239/240, americium-241, carbon tetrachloride, methylene chloride
200-PW-1 200-PW-6	216-Z-1&2 Crib 216-Z-3 Crib 216-Z-12 Crib 216-Z-5 Crib (200-W-208-PL Pipeline) (200-W-210-PL Pipeline)	Low-Salt	plutonium 239/240, americium-241
200-PW-1 200-PW-6	241-Z-361 Settling Tank 241-Z-8 Settling Tank (200-W-205-PL Pipeline) (200-W-220-PL Pipeline)	Settling Tanks	plutonium 239/240, americium-241
200-PW-3*	216-A-7 Crib 216-A-8 Crib 216-A-24 Crib 216-A-31 Crib UPR-200-E-56 Unplanned Release	Cesium-137	cesium-137
200-PW-6	216-Z-8 French Drain 216-Z-10 Injection/Reverse Well	Other Sites	None Identified

* Pipelines associated with 200-PW-3 are part of another OU.

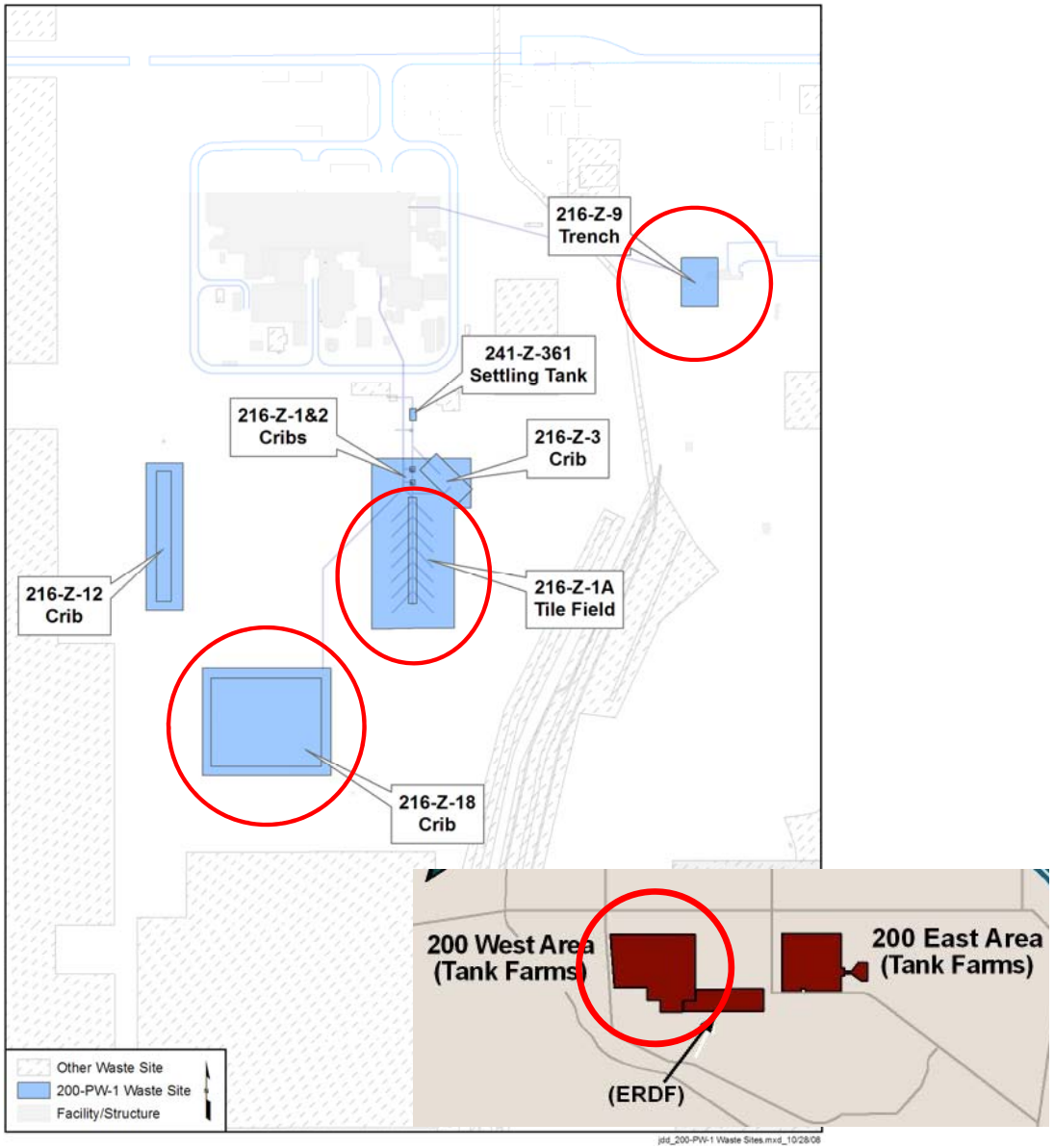
Aerial View of 200 Area

200 West

200 East

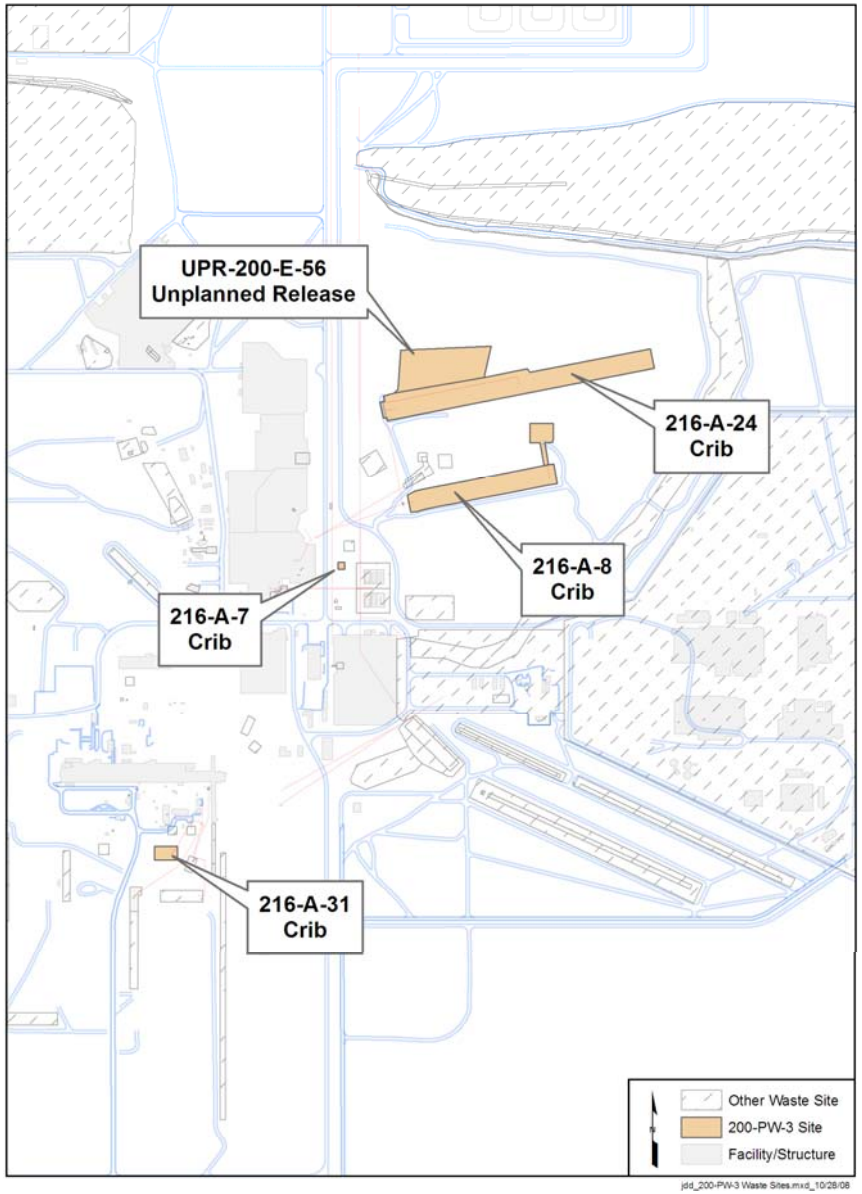
200-PW-1/6 OUs

- High-Salt Sites
  - 216-Z-1A Tile Field, 216-Z-9 Trench, 216-Z-18 Crib
  - Received highly acidic aqueous waste uranium/plutonium recovery
- Low-Salt Sites
  - 216-Z-1/2/3/12 Cribs
  - Received neutral to basic aqueous waste



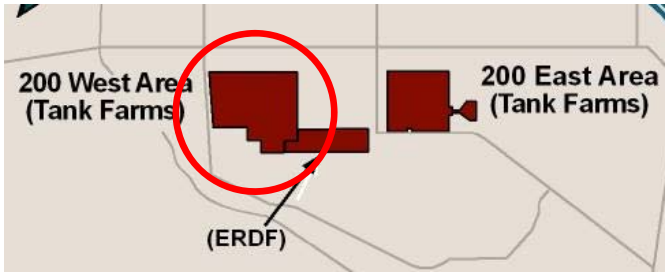
200-PW-3 OU

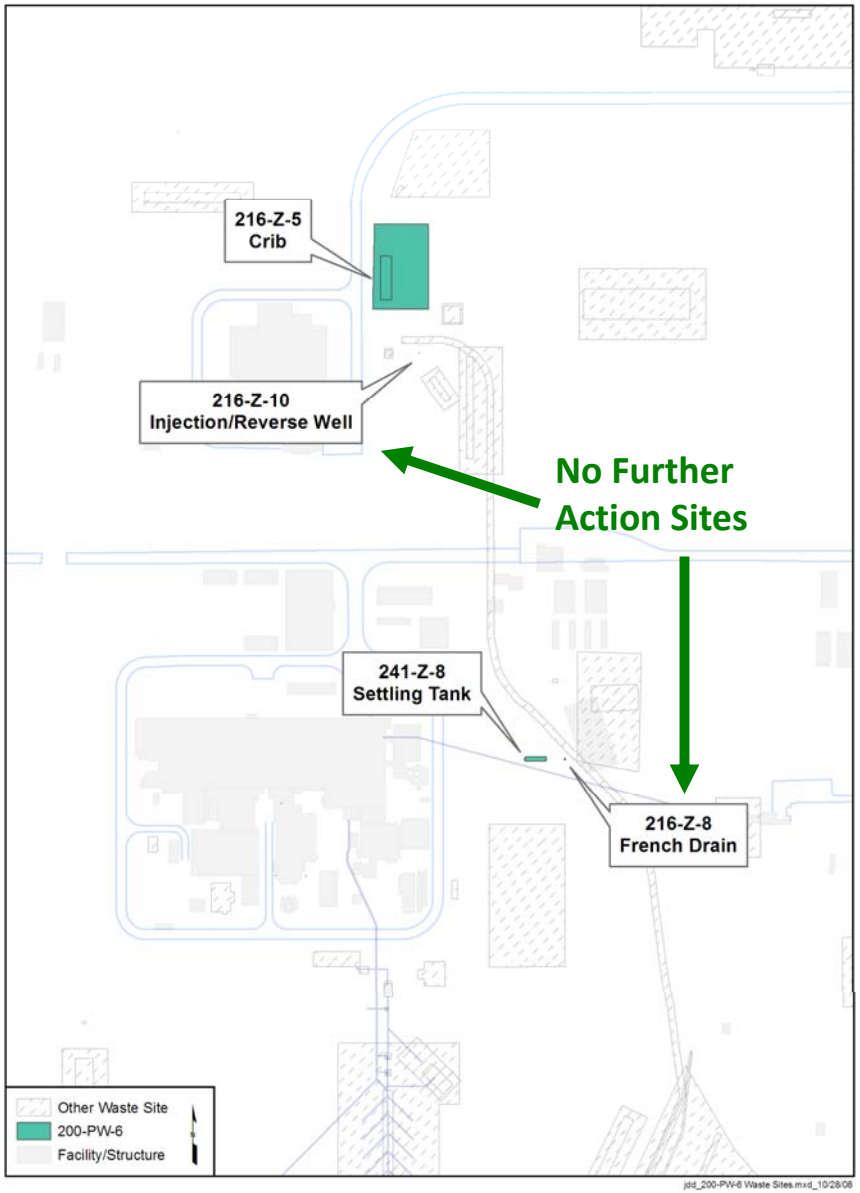
- 5 Cesium-137 Sites in 200 East
- Received process waste from PUREX



200-PW-6 OU

- Liquid waste discharged into the soil in the injection/reverse well
- Overflow from the settling tank emptied into the French drain
- No further action required

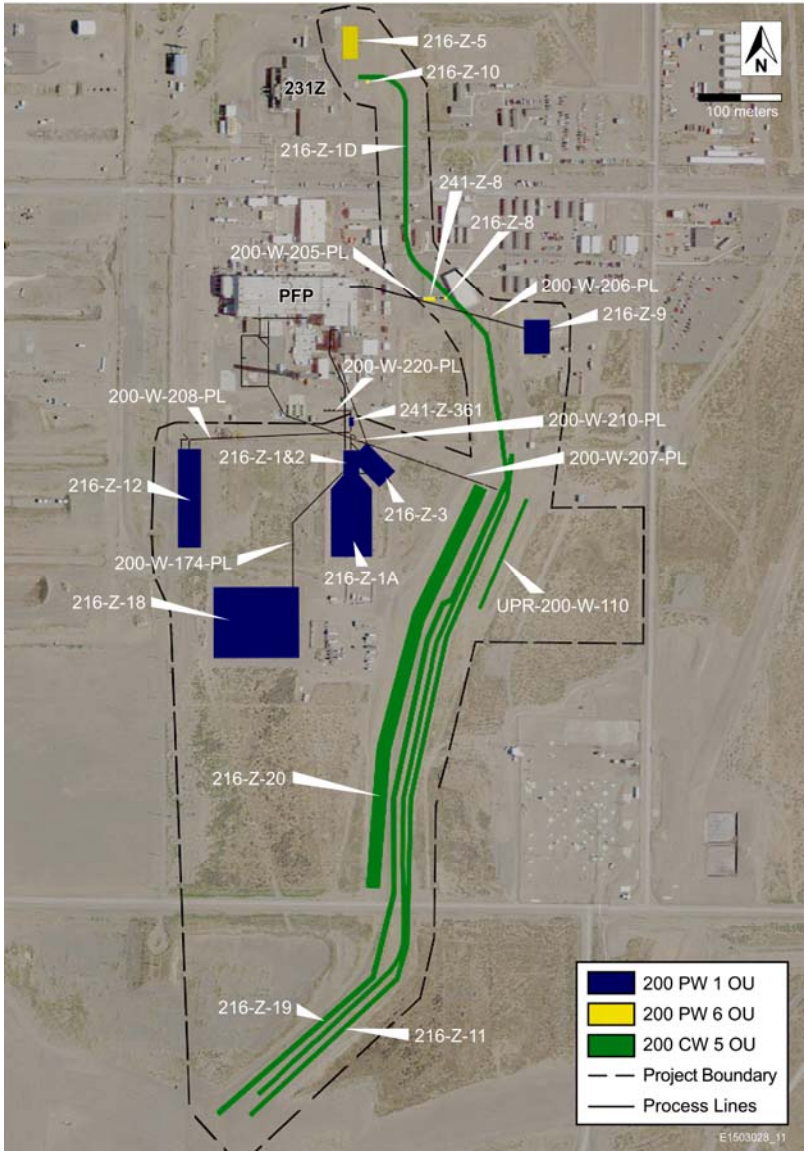




200-CW-5

- Z Ditches
  - 3 shallow open ditches
  - 1 tile field
  - 1 unplanned release site

- Received cooling water and steam condensate from the Plutonium Finishing Plant Complex



Summary of Remedy (2011 ROD)

Table 32. Summary of Remedial Actions Selected by Waste Group

Waste Group	Selected Remedy
Z-Ditches	RTD with disposal at ERDF or WIPP, as appropriate.
High-Salt	RTD- Option A: Remove soil to 0.6 m (2 ft) below the bottom of the disposal structure to 20 ft - 23 ft. Plutonium waste will be disposed of at WIPP or ERDF, as appropriate. SVE to treat VOCs. Use of evapotranspiration barriers.
Low-Salt	RTD—Option C: Remove soil up to a depth of 22 ft - 33 ft at each waste site. Plutonium waste will be disposed of at WIPP or ERDF, as appropriate. Use of evapotranspiration barriers.
Cesium-137	Maintain/Enhance Soil Cover. Maintain a 15 ft thickness of soil cover over these waste sites.
Settling Tanks	Sludge Removal and Tank Stabilization.
Other Sites	No action since these waste sites do not pose a risk to human health and the environment.

*Settling Tanks remedy expected to change from grouting in place to complete removal

Major EPA Comment on Draft RD/RA WP

- Need a schedule with dates (not a duration schedule)
  - Long timeframes are a concern
- Cost estimates are much higher than in ROD
- Change to Setting Tank remedy will require a decision document
- Need to have discussion on additional soil removal criteria
  - These criteria have not been established yet

Additional Soil Excavation Discussion

- ROD language: "*After excavating to the specified depths in these waste sites, plutonium-239/240 levels will be assessed in accordance with a sampling and analysis plan that will be part of the RD/RA work plan. DOE will consider removing additional plutonium-contaminated soil from these waste sites.*"

- Samples will be taken as described in the SAP.
  - Gridded radiological surveys using field portable instrumentation
  - Pu-239/240 and Am-241 focused samples for lab analysis

- Criteria to determine further excavation needs to be developed in time to support DOE/EPA discussion of sample results.

Differences of the ROD and the RD/RAWP

- ROD assumed open air excavation and RD/RAWP (based upon analysis) concludes containment facilities and special excavation equipment are required.

- Excavation volumes are significantly greater in RD/RAWP.

- ROD assumed settling tanks closed in place, RD/RAWP assumed RTD due to technical complexities.

RD/RAWP and ROD Cost Comparison

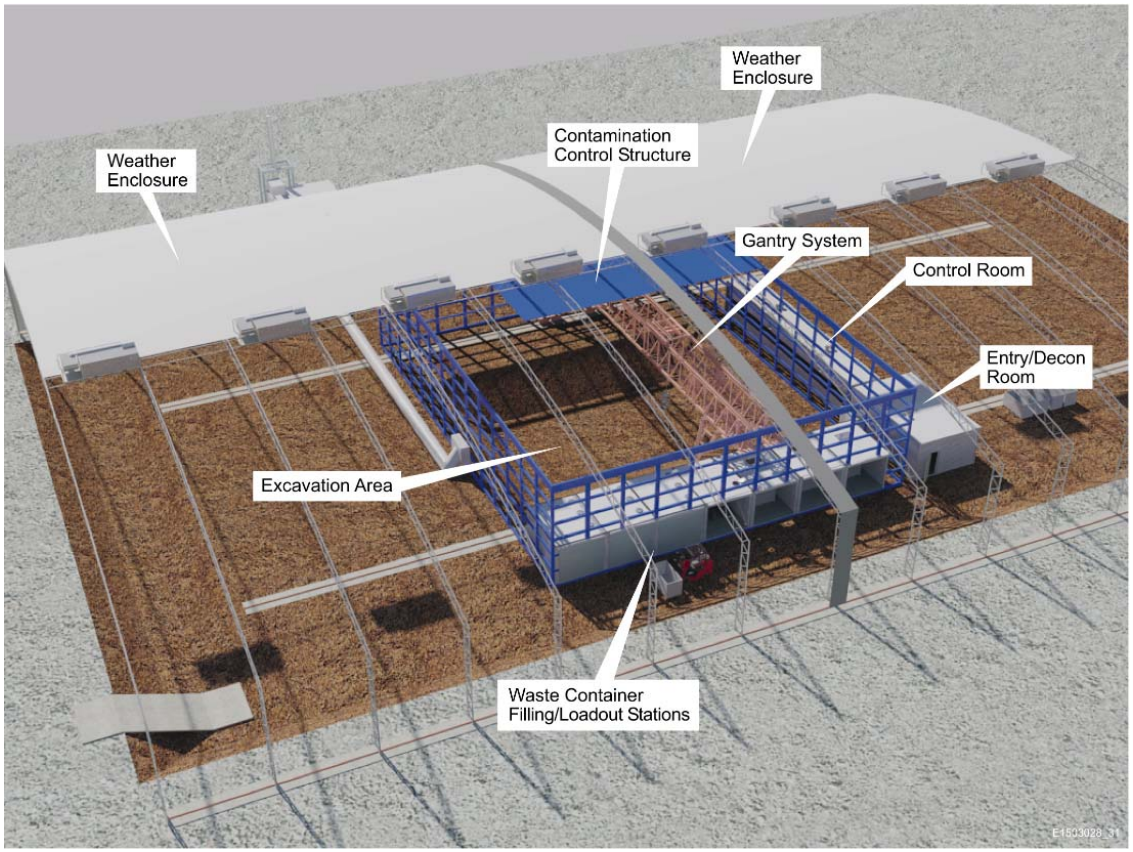
WBS No.	WBS Description	RD/RAWP Estimate (2015 $M)	ROD Estimate (2015 $M)	Cost Difference (2015 $M)
1.1	Manage 200-CW-5 and 200-PW-1/3/6 Remediation	$ 392	$ 48	$ 344
1.2	Remove, Treat, and Dispose of Contaminated Soil and Debris	$ 517	$ 258	$ 259
1.3	Remove, Treat, and Dispose of Settling Tanks	$ 70	$ 38	$ 32
1.4	Enhance Soil Cover, Install ET Barriers, and Demobilize the Project	$ 33	$ 8	$ 25
1.5	Long-Term Stewardship	$ 97	$ 406	$ (309)
	TOTAL	**$ 1,109**	**$ 758**	**$ 351**

ROD Estimate: +50% to -30% of the actual project cost

RD/RAWP Estimate: +30% to -20% of the actual project cost (Class III FS-type of estimate per DOE G 413.3-21, *Cost Estimating Guide*)

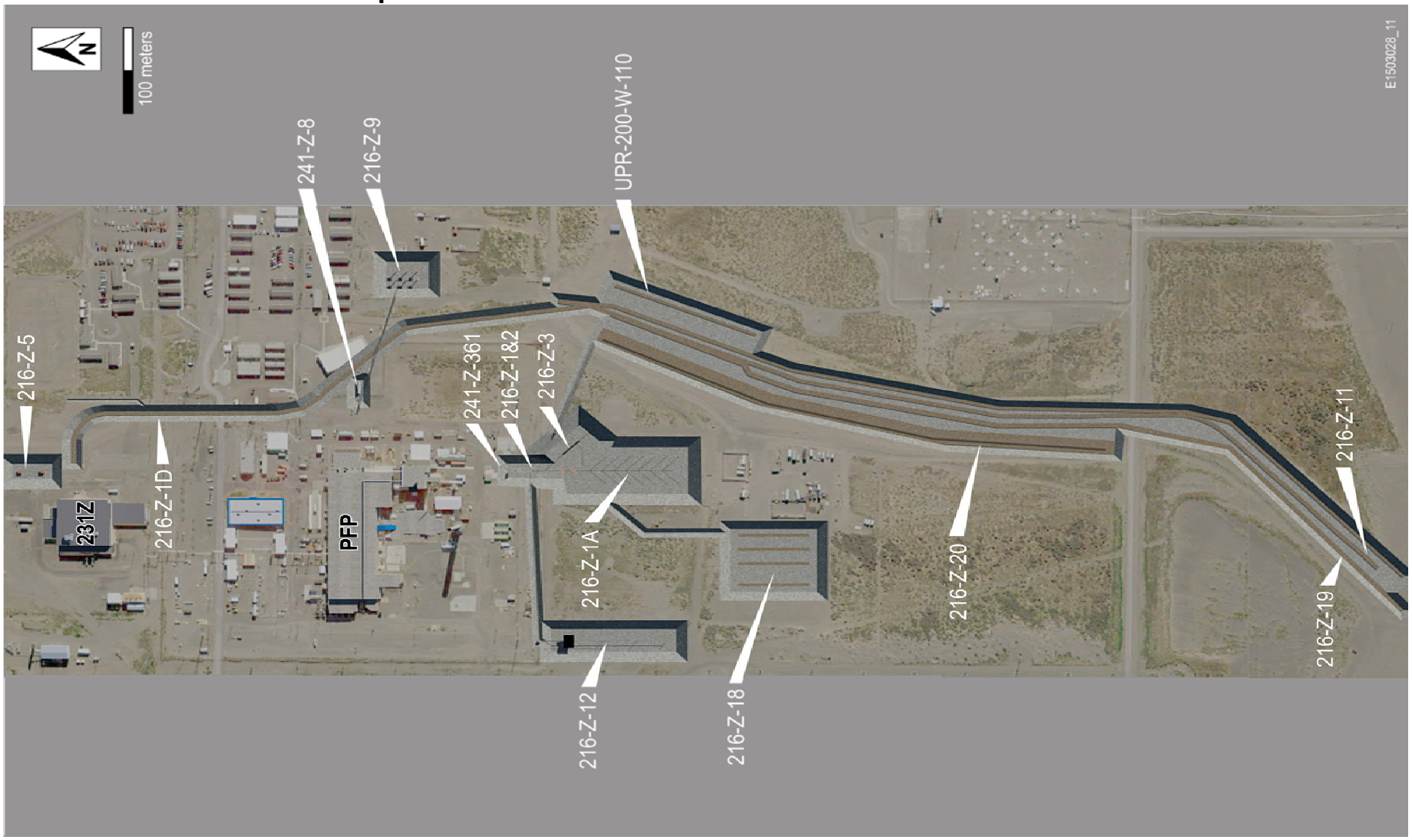
Weather Enclosure and Contamination Control Structure

Weather Enclosure

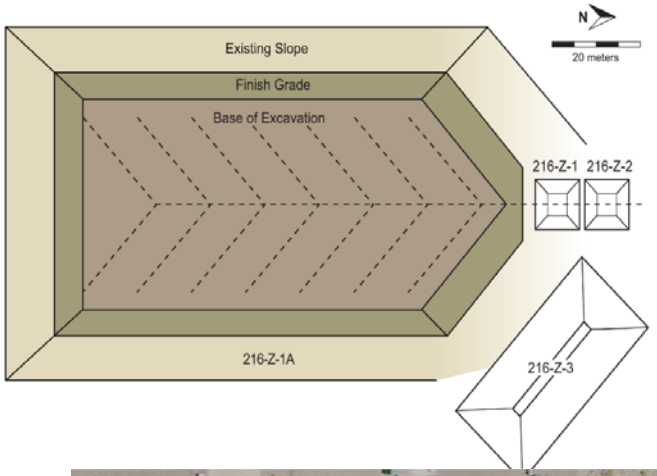


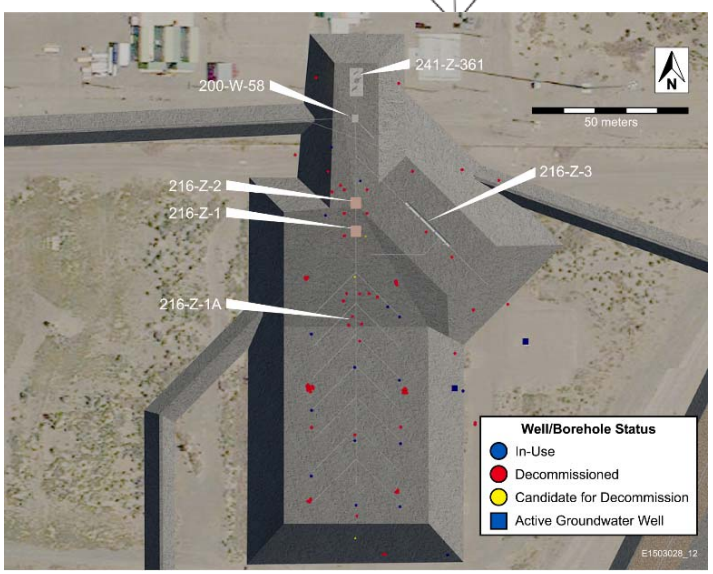
Contamination Control Structure

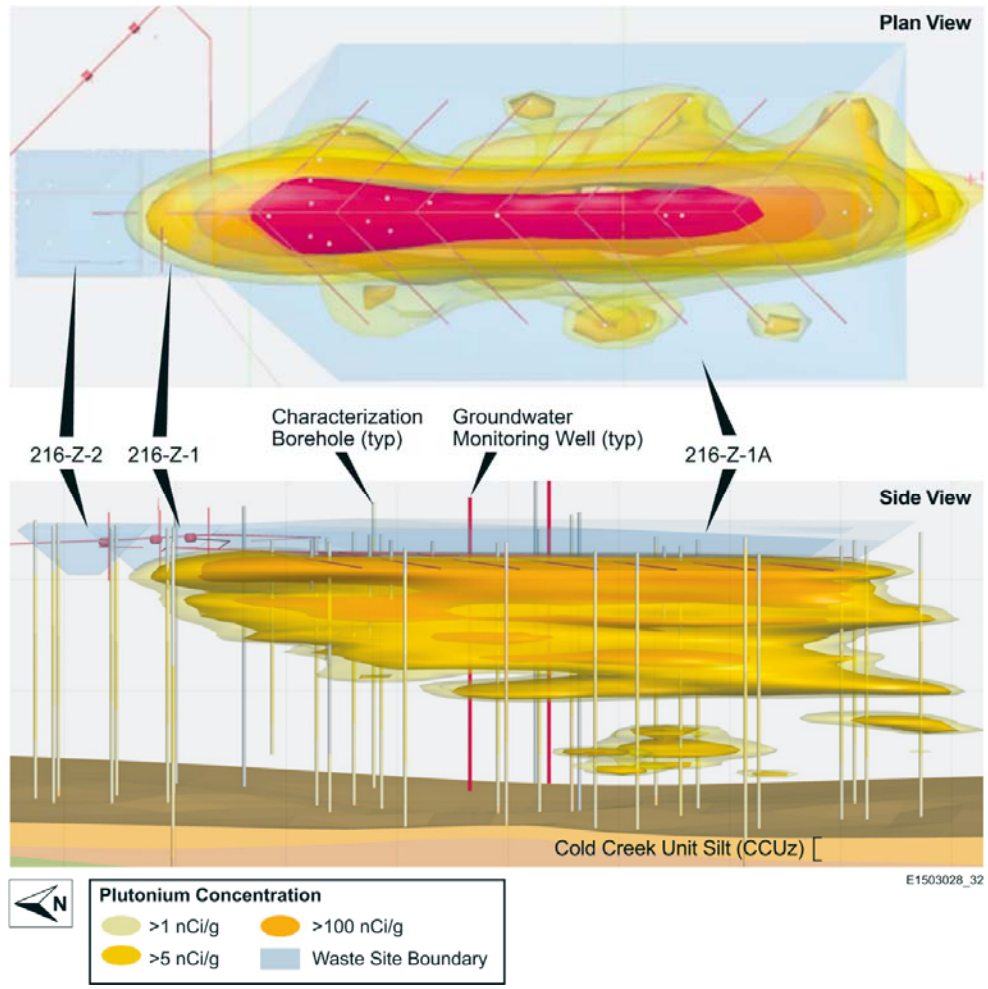
Excavation Footprint



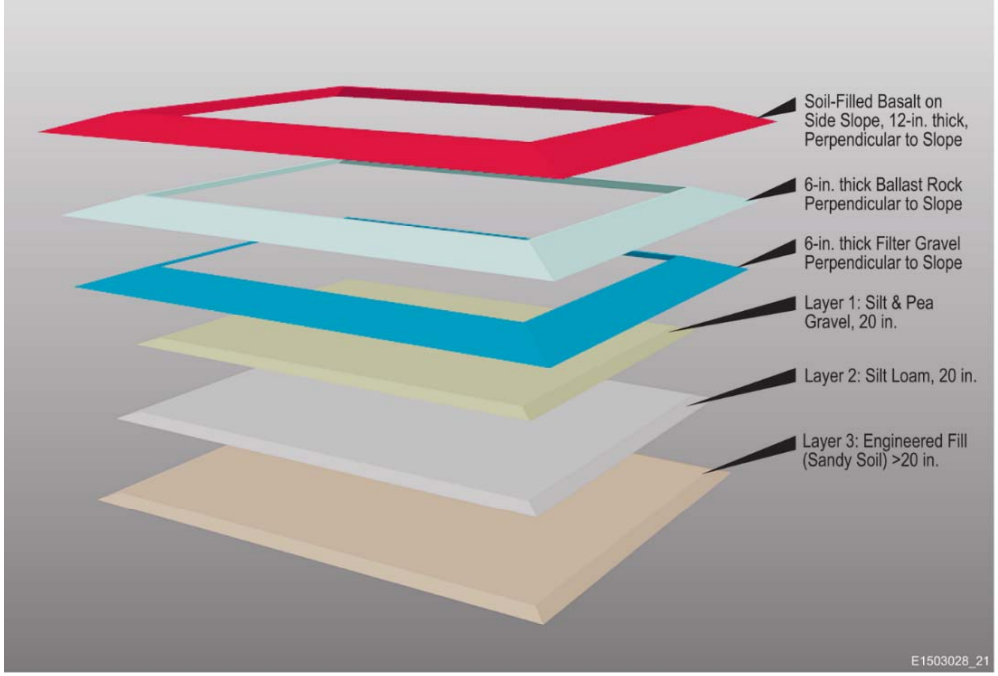
RTD of Soil and Debris from 216-Z-1A, 1, 2, and 3

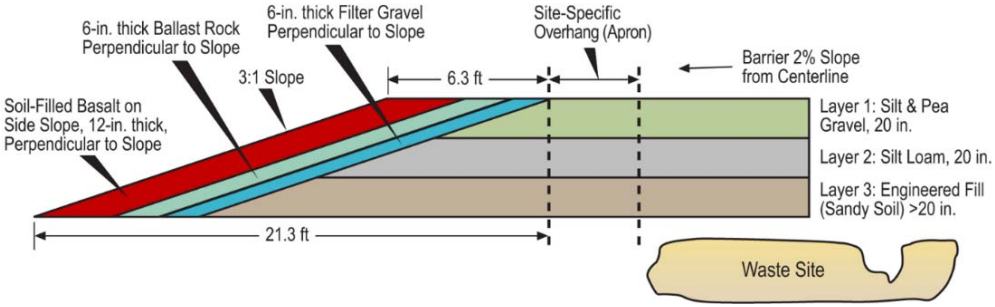


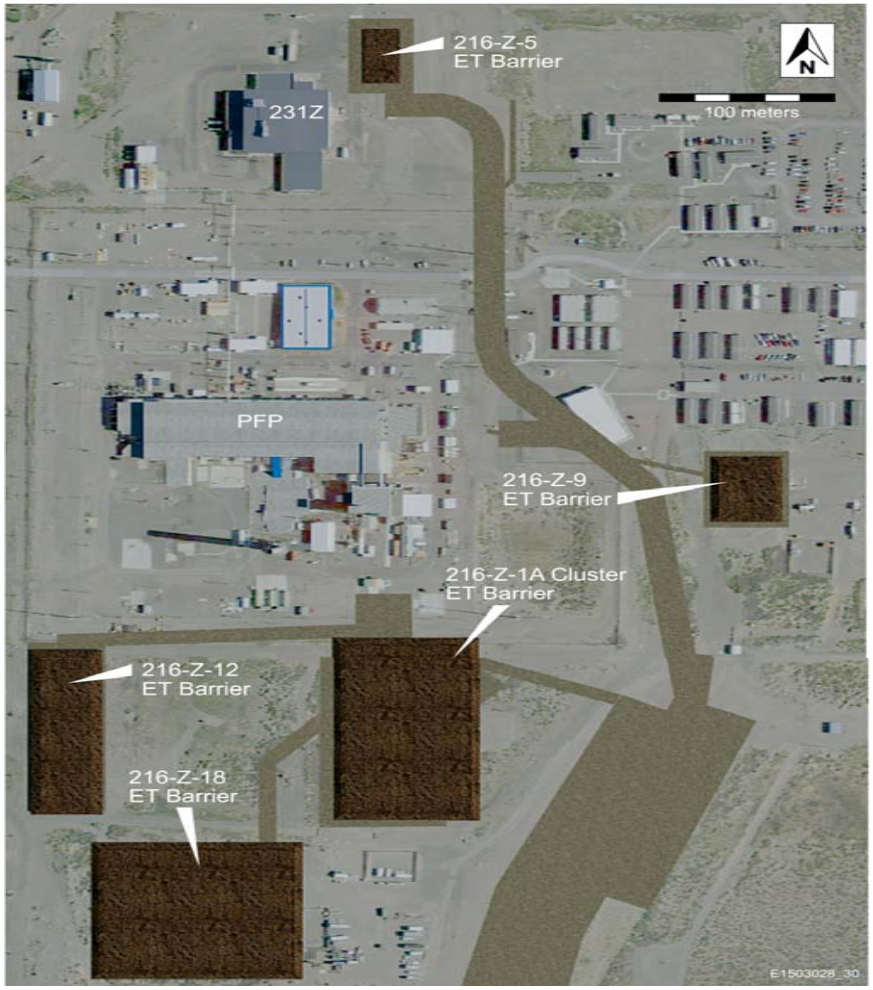




Install ET Barriers on High And Low Salt Groups

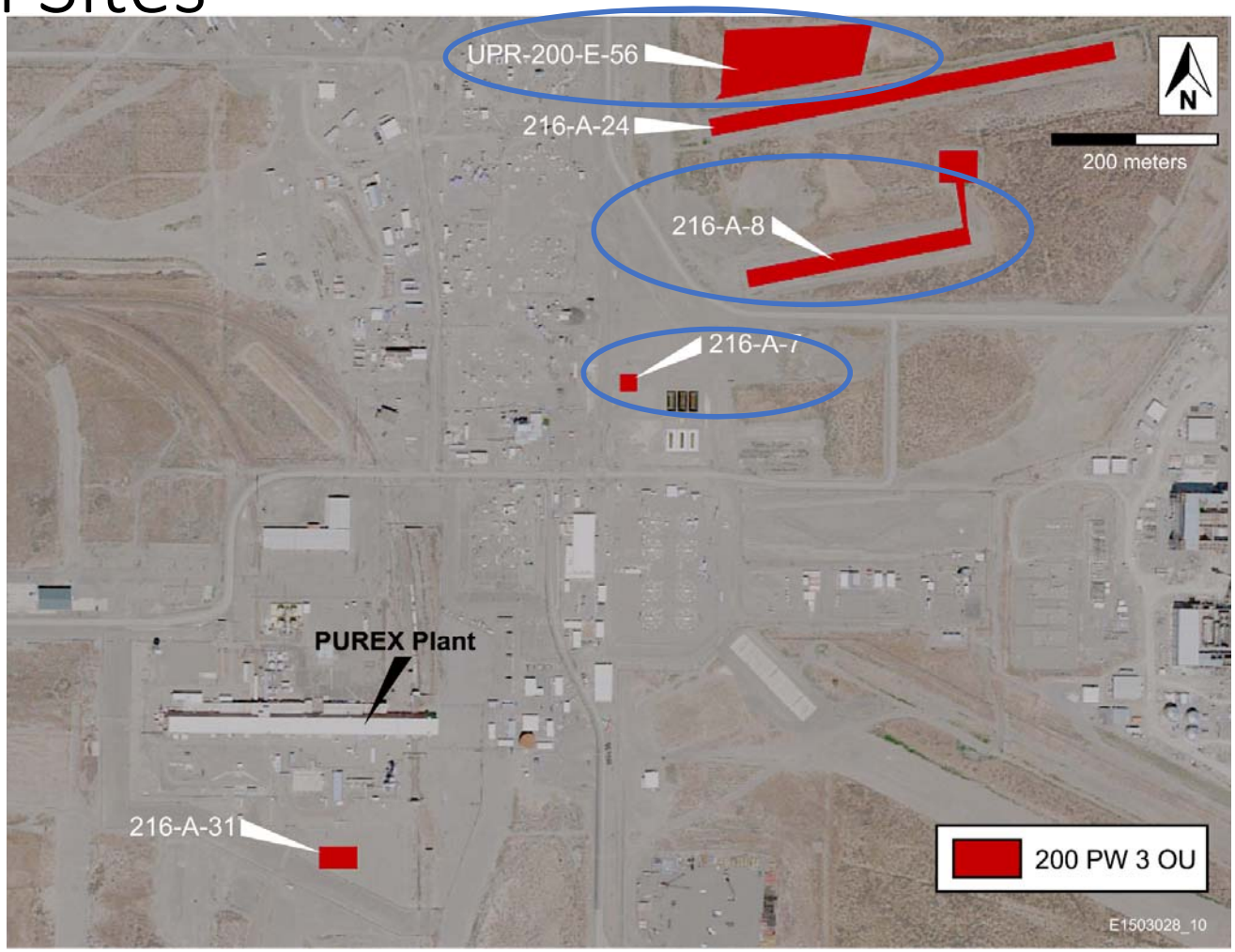




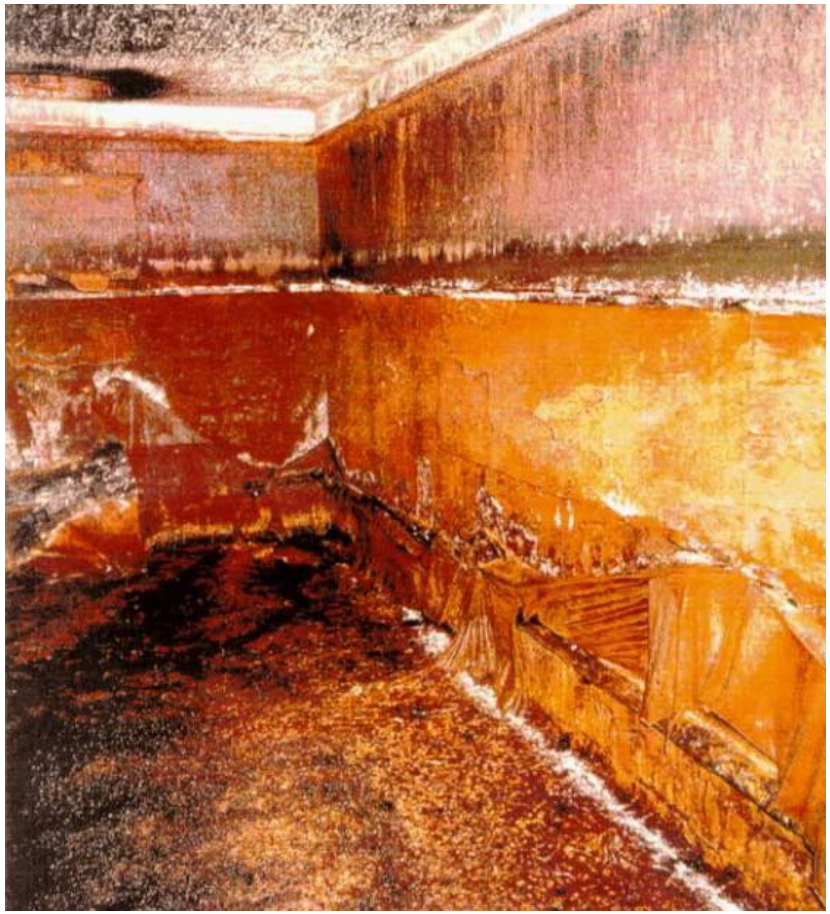


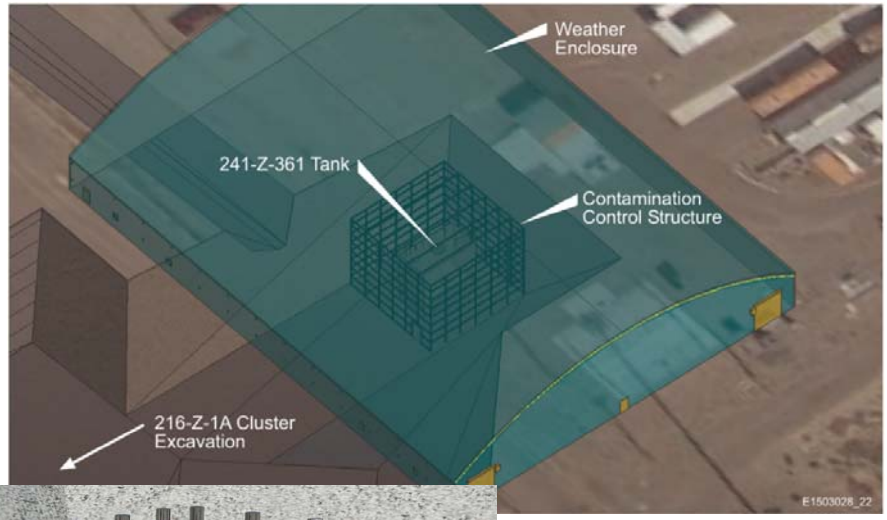
200-PW-3 Cesium Sites

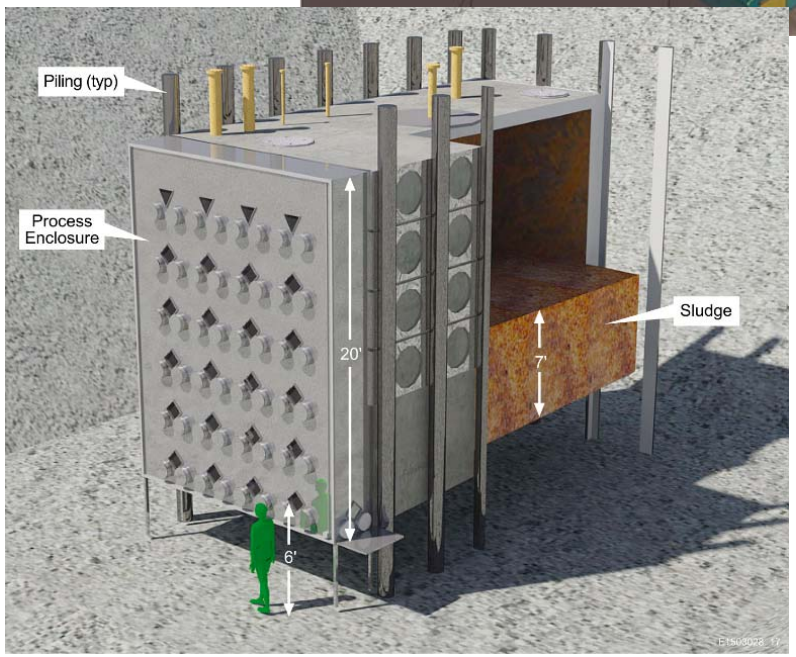
- Maintain and Enhance Existing Soil Covers
- Minimum cover depth of 15 ft.
- Allows for radioactive decay of Cs-137



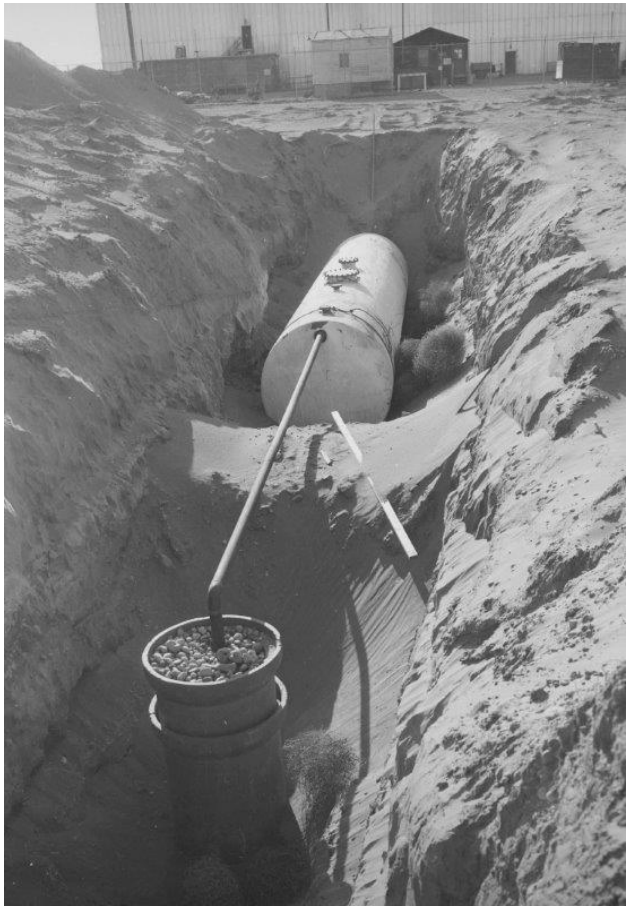
Settling Tank 241-Z-361

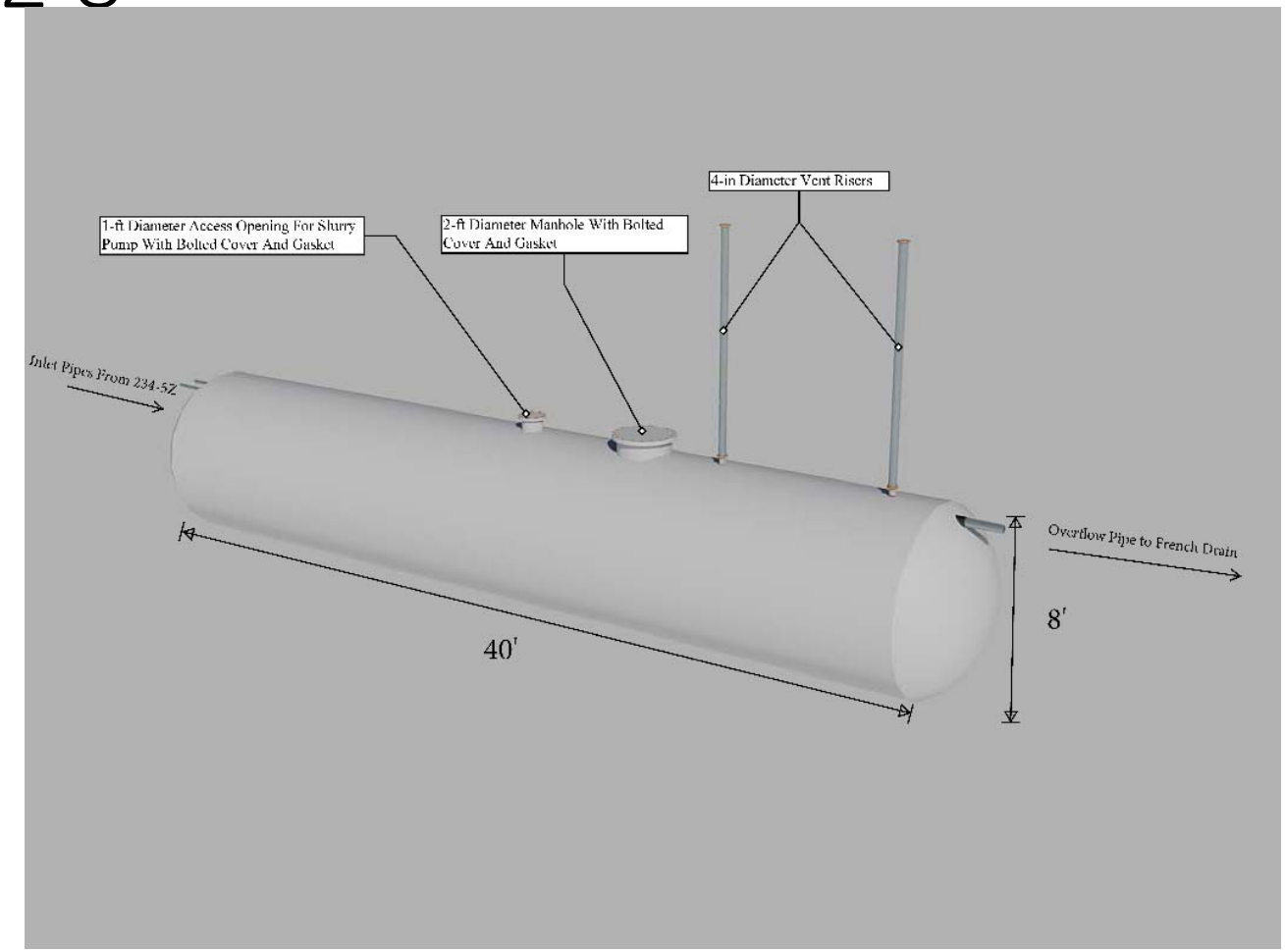




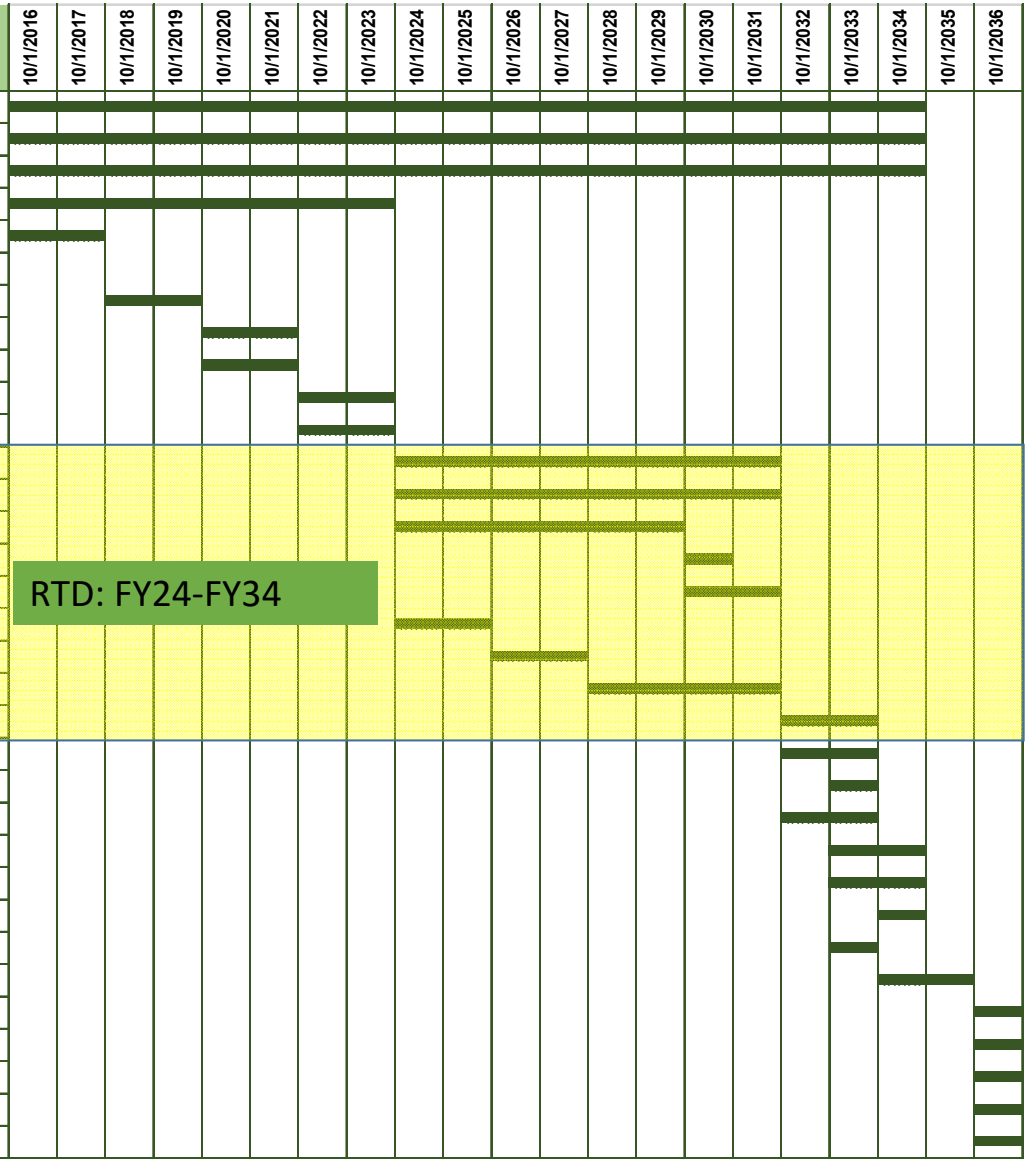


Settling Tank 241-Z-8





No.	Task Name	Cost ($K)
1	Remediate 200-CW-5 and 200-PW-1/3/6 Operable Units	$1,108,000
1.1	Manage 200-CW-5 and 200-PW-1/3/6 Remediation	
1.1.1	Project Management and Support for 200-CW-5 and 200-PW-1/3/6 Remediation	$97,000
1.1.2	Acquire Remediation System for 200-CW-5 and 200-PW-1/3/6	
1.1.2.1	Request and Obtain Project Funding	
1.1.2.2	CD-0, Approve Mission Need	$320
1.1.2.3	CD-0 to CD-1, Approve Alternative Selection and Cost Range	$33,000
1.1.2.4	CD-1 to CD-2, Approve Performance Baseline	$18,000
1.1.2.5	CD-2 to CD-3, Approve Start of Construction/Execution	$23,000
1.1.2.6	CD-3 to CD-4, Approve Start of Operations or Project Completion	$209,000
1.1.3	Mobilize Remediation System for 200-CW-5 and 200-PW-1/3/6	$12,000
1.2	Remove, Treat, and Dispose of Contaminated Soil and Debris	
1.2.1	Manage RTD of Contaminated Soil and Debris	$78,000
1.2.2	RTD of Soil and Debris from Z Ditches	$134,000
1.2.3	RTD of Soil and Debris from 216-Z-5	$4,000
1.2.4	RTD of Soil and Debris from 216-Z-18	$59,000
1.2.5	RTD of Soil and Debris from 216-Z-9	$27,000
1.2.6	RTD of Soil and Debris from 216-Z-12	$64,000
1.2.7	RTD of Soil and Debris from 216-Z-1A, Z-1, Z-2, and Z-3	$150,000
1.3	Remove, Treat, and Dispose of Settling Tanks	
1.3.1	Manage RTD of Settling Tanks	$27,000
1.3.2	RTD of Tank 241-Z-8	$9,000
1.3.3	RTD of Tank 241-Z-361	$34,000
1.4	Enhance Soil Cover, Install ET Barriers, and Demobilize the Project	
1.4.1	Manage Enhance Soil Cover, Install ET Barriers, and Demobilize the Project	$20,000
1.4.2	Enhance Soil Cover for Cs-137 Waste Sites	$605
1.4.3	Install ET Barriers	$3,000
1.4.4	Demobilize the Project	$9,000
1.5	Long-Term Stewardship	
1.5.1	Manage Long-Term Stewardship	
1.5.2	Institutional Controls	$31,000
1.5.3	Surveillance, Operations, and Maintenance	$61,000
1.5.4	CERCLA 5-Year Review	$6,000



Questions

Backup Slides

RD/RAWP and ROD Scope Comparison

- <u>200-CW-5 and 200-PW-1/3/6 Remediation (+$344M)</u>
  - Design includes Weather Enclosures and Contamination Control Structures

- <u>Remove, Treat, and Dispose of Contaminated Soil and Debris (+$259M)</u>
  - Excavation Volume [RD/RAWP ~ 430,000 m3 vs ~ 260,000 m3]
  - RD/RAWP includes ~ 40,000 m3 for pipeline excavation
  - TRU Volume [RD/RAWP ~ 6,000 m3] [ROD ~ 2,300 m3]

- <u>Remove, Treat, and Dispose of Settling Tanks (+$32M)</u>
  - ROD removes sludge, stabilizes tanks, and leaves tanks in place
  - RD/RAWP removes sludge, removes tanks, backfills and re-vegetates excavation area

- <u>Enhance Soil Cover, Install ET Barriers, and Demobilize the Project (+25M)</u>
  - RD/RAWP identified ~ 90 active groundwater monitoring wells in the excavation or barrier footprint

- <u>Long-Term Stewardship (-$309M)</u>
  - RD/RAWP used ECF-Hanford-12-0067, Institutional Controls Costs Apportioned by ROD Groups,
  - ROD O&M costs include 1,000 year IC/O&M