APPENDIX G.10

GROUT VAULTS (CP-LS-16 CENTRAL PLATEAU)
EVALUATION UNIT SUMMARY TEMPLATE

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PART I. EXECUTIVE SUMMARY

EU LOCATION

The Grout Vaults Evaluation Unit (CP-LS-16) is located in the 200 East Area, west of the Waste Treatment Plant (WTP)

RELATED EUS

NA

PRIMARY CONTAMINANTS, CONTAMINATED MEDIA AND WASTES

Approximately one million gallons of liquid phosphate-sulfate waste (PSW) from N Reactor was mixed with grout and disposed as a monolithic solid waste located in vault V-101 of the Grout Treatment Facility. The PSW was a low-level radioactive waste that contained source term radioactivity of 0.11mCi/L dominated by Co-60 (0.11mCi/L) and leachable Tc-99 (55 nCi/L) and Sr-90 (33 nCi/L). In terms of total alpha and total beta, it contained 7.79 nCi total alpha and 9,260 mCi total beta during the grouting campaign.[1]

Negligible amounts of radiological contaminates are known to be present at other above and below ground areas of the EU.[2]

BRIEF NARRATIVE DESCRIPTION

In April 1988 a ROD was issued with regard to the disposal of the following defense wastes at the Hanford site: double-shell tank wastes, retrievably stored and newly generated transuranic (TRU) waste, the only pre-1970 buried suspect TRU-contaminated solid waste site outside the central (200 Area) plateau, and strontium and cesium encapsulated wastes. DOE's "Preferred Alternative" included the mixing of the low-activity fraction of wastes in the double shell tanks with a cement-based grout and disposal of the mixture in near surface preconstructed, lined concrete vaults. This decision was based on DOE's "Final Environmental Impact Statement for the Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes'' (DOE/EIS-0113). Approximately 200 vaults were to be constructed specifically designed to meet long-term performance requirements and those of the Resource Conservation and Recovery Act of 1976 and were to be covered by a protective barrier and marker system.

To demonstrate the grouting concept and the mixture that would be stored in these vaults, the DOE grouted and disposed of approximately one million gallons of liquid phosphate-sulfate waste (PSW) in 1988-89. The PSW grout was disposed as a monolithic solid waste located in vault V-101 of the GTF. The PSW was N Reactor's decontamination waste and was chosen because it was a low-level radioactive waste that contained source term radioactivity of 0.11mCi/L. Also, the chemical component of the waste stream was not considered a dangerous waste according to the requirements of the Washington Administrative Code (WAC) 173-303-070.[1]

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[1] State of Washington, Department of Ecology, *Grout Treatment Facility Regulatory Closure Final Report*, July 2009
[2] DOE, Hanford, *Waste Information Data System* (*WIDS)*

In the early 1990s Washington State regulators and other stakeholders raised concerns about the grout's ability to prevent long-lived radionuclides, such as technetium-99, from migrating into groundwater over a long period, as well as the large land area (over 200 acres) that would be needed for the underground vaults. DOE suspended this effort and in 1994 it officially decided against the use of grout and chose to pursue vitrifying the low-activity tank wastes. Only four other underground vaults were constructed between 1984 and 1988. None of them accepted or managed dangerous or mixed waste and they remain empty today. The Grout Treatment Facility (GTF) and other related buildings and equipment were abandoned in place.

Washington State's Department of Ecology evaluation in 2009 found that the phosphate-sulfate waste (PSW) grout disposed of in vault v-101 "does not pose any immediate threat to human health and the environment."[3]

Although the mapped area of this CP-LS-16 EU includes waste sites 216-A-37-1 (cribs) and 216-A-29 (ditch), they are not included in this risk review. The 216-A-37-1 site is associated with the 242-A Evaporator (CP-OP-10) and the 216-A-29 site is associated with the B Pond (CP-LS-11).

SUMMARY TABLES OF RISKS AND POTENTIAL IMPACTS TO RECEPTORS

Table G.10-1 provides a summary of nuclear and industrial safety related risks to humans and impacts to important physical Hanford site resources.

Human Health

A Facility Worker is deemed to be an individual located anywhere within the physical boundaries of the Grout Vaults (CP-LS-16) area; a Co-located Person (CP) is an individual located 100 meters from the physical boundaries of thee; and the Public is an individual located at the closest point on the Hanford Site boundary not subject to DOE access control which is about 9.5 miles away. The nuclear-related risks to humans are based on unmitigated (unprotected or controlled conditions) dose exposures expressed in a range of from *Not Discernible* (*ND*) to *High*. The estimated mitigated exposure, which takes engineered and administrative controls and protections into consideration, is shown in Table G.10-1 in parentheses.

Groundwater and Columbia River

Direct impacts to groundwater resources and the Columbia River have been rated based on available information for the current status and estimates for future time periods. These impacts are also expressed in a range of from *Not Discernible* (*ND*) to *Very High*.

Ecological Resources[4]

The risk ratings are based on the degree of physical disruption (and potential additional exposure to contaminants) in the current status and as a potential result of remediation options.

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[3] State of Washington Department of Ecology, letter to Hanford Office of River Protection and Richland Operations Office, Re: The Path Forward to Terminate the Grout Treatment Facility in Respect to the *Hanford Facility Dangerous Waste Permit* August 18, 2009.

[4] References throughout this Evaluation Unit Summary Template supporting analyses related to Ecological Resources and/or Cultural Resources may be found in Appendices J and K, respectively. Refer to the specific EU when searching for the reference.

Cultural Resources[4]

No risk ratings are provided for Cultural Resources. The Table identifies the three overlapping Cultural Resource landscapes that have been evaluated: Native American (approximately 10,000 years ago to the present); Pre-Hanford Era (1805 to 1943) and Manhattan/Cold War Era (1943 to 1990); and provides initial information on whether an impact (both direct and indirect) is KNOWN (presence of cultural resources established), UNKNOWN (uncertainty about presence of cultural resources), or NONE (no cultural resources present) based on written or oral documentation gathered on the entire EU and buffer area. Direct impacts include but are not limited to physical destruction (all or part) or alteration such as diminished integrity. Indirect impacts include but are not limited to the introduction of visual, atmospheric, or audible elements that diminish the cultural resource's significant historic features. Impacts to Cultural Resources as a result of proposed future cleanup activities will be evaluated in depth under Section 106 of the National Historic Preservation Act (16 USC 470, et. seq.) during the planning for remedial action.

Table G.10-1. Risk Rating Summary (for Human Health, unmitigated nuclear safety basis indicated, mitigated basis indicated in parentheses (e.g., "Very High" (Low)).

Population or Resource		Evaluation Time Period	
		Active Cleanup (to 2064)	
		Current Condition: No Activity	**From Cleanup Actions:** Final D&D
Human Health	Facility Worker	ND	ND
	Co-located Person	ND	ND
	Public	ND	ND
Environmental	Groundwater[a]	ND	ND
	Columbia River[a]	ND	ND
	Ecological Resources[b]	ND	Low to Medium
Social	Cultural Resources[b]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: None **Manhattan/Cold War** Direct: None Indirect: Known	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: None **Manhattan/Cold War** Direct: None Indirect: Unknown

a. Threat to groundwater or the Columbia River from Group A and B primary contaminants (PCs) (Table 6-1, CRESP 2015) remaining in the vadose zone. There are no vadose zone inventories associated with this EU (i.e., grout vaults are considered isolated from the vadose zone during the evaluation period), and thus no threat to the vadose zone, groundwater, or the Columbia River.

b. For both Ecological and Cultural Resources see Appendices J and K, respectively, for a complete description of Ecological Field Assessments and literature review for Cultural Resources. Ecological ratings are described in Table 4-11 of the Final Report.

SUPPORT FOR RISK AND IMPACT RATINGS FOR EACH POPULATION OR RESOURCE HUMAN HEALTH

Current

Approximately one million gallons of liquid phosphate-sulfate waste (PSW) from N Reactor was mixed with grout and disposed as a monolithic solid waste located in vault V-101 of the Grout Treatment Facility. The PSW was a low-level radioactive waste that contained source term radioactivity of 0.11mCi/L. Also, the chemical components of the waste stream were not considered to be a dangerous waste according to the requirements of the Washington Administrative Code (WAC) 173-303-070.[5] Only four other underground vaults were constructed, and none of them accepted or managed dangerous or mixed waste and they remain empty today. The mobile Grout Processing Facility and other related buildings and equipment were abandoned in place. Negligible amounts of radiological contaminates are known to be present at other above and below ground areas of the EU.[6] Although no Hazard or Documented Safety Analysis has been developed, an evaluation by the State of Washington's Department of Ecology in 2009 found that the phosphate-sulfate waste (PSW) grout disposed of in the GTF vault "does not pose any immediate threat to human health and the environment."[7]

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

According to DOE/RL-2010-22[8] the proposed remedial actions for facilities of this type are the demolition of building and structures will include removal of above grade structures. If below grade structures (including pipes and utility systems) are not contaminated or may be decontaminated, they will optionally be left in place, backfilled, and brought to grade. Backfill will consist of clean fill materials and/or inert demolition waste from the above grade structures. This Alternative meets the proposed removal action objectives (RAOs) regarding long-term risk, minimizes short-term worker risk and radiation exposure, is cost effective, meets applicable or relevant and appropriate requirements (ARARs), and provides a safe and stable configuration that is environmentally sound.

Groundwater, Vadose Zone, and Columbia River

There are no reported vadose zone inventories (i.e., reported inventories are in the grout vaults that is considered isolated from the environment during the evaluation period) and thus no significant threats to the vadose zone, groundwater, or the Columbia River for the purposes of this Review.

[5] State of Washington, Department of Ecology, *Grout Treatment Facility Regulatory Closure Final Report*, July 2009
[6] DOE, Hanford, *Waste Information Data System* (*WIDS)*
[7] State of Washington Department of Ecology, letter to Hanford Office of River Protection and Richland Operations Office, Re: The Path Forward to Terminate the Grout Treatment Facility in Respect to the *Hanford Facility Dangerous Waste Permit* August 18, 2009.
[8] US Department of Energy, Richland Operations Office, *Action Memorandum for General Hanford Site Decommissioning Activities*, DOE/RL-2010-22, Revision 0, March 29, 2010.

Ecological Resources

Current

0% of EU and 21% of the buffer area are level 3 or higher resources. No wildlife were observed in the EU.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Uncertainties in the remediation activities makes it difficult to predict the extent and magnitude of impacts to the EU and buffer. Deposition of waste at the facility and future cleanup actions will increase truck traffic to the region. Increased traffic and herbicide application will impact level 3 resources in the buffer. Potential for excavation maybe required and backfill/revegetation would occur. Medium impacts are likely if excavation is required because of heavy equipment and potential to introduce exotic species.

Cultural Resources

Current

No known archaeological sites, inventoried historic buildings, or TCPs are located within the EU. Geomorphology indicates a low potential to contain intact archaeological resources on the surface and/or subsurface. Traditional cultural places are visible from EU.

National Register eligible Manhattan Project/Cold War Era significant resources located within the EU and 500 meters of the EU will be demolished, but they have already been mitigated.

Risks and Potential Impacts from Selected or Potential Cleanup Approaches

Archaeological investigations and monitoring may need to occur prior to remediation. The geomorphology indicates a low potential for intact archaeological resources. Remediation disturbance may result in impacts to archaeological resources if they are present in the subsurface. Temporary indirect effects to viewshed are possible during remediation.

National Register eligible Manhattan Project/Cold War Era significant resources located within the EU and 500 meters of the EU, some will be demolished, but they have already been mitigated.

Considerations for Timing of the Cleanup Actions

This is an inactive site and does not represent a risk to human health.

Near-Term, Post-Cleanup Risks and Potential Impacts

The proposed cleanup approach meets the removal action objectives (RAOs) regarding long-term risk, minimizes short-term worker risk and radiation exposure, is cost effective, meets applicable or relevant and appropriate requirements (ARARs), and provides a safe and stable configuration that is environmentally sound.

PART II. ADMINISTRATIVE INFORMATION

OU AND/OR TSDF DESIGNATION(S)

Not applicable

COMMON NAME(S) FOR EU

Grout Vaults, GTF

KEY WORDS

Grout, vaults

REGULATORY STATUS

Regulatory basis

CERCLA: This removal action is consistent with the remedial action objectives of previous Records of Decision (RODs and supports the overall cleanup objectives established through the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989)**.** Completion of the removal action will place the identified buildings and structures and the debris in a condition protective of human health and the environment.[9]

In 2009 the Washington Department of Ecology, with agreement from DOE, denied the unit specific permit application for the Grout Treatment Facility Dangerous Waste Management Units (GTF-DWMU) versus establishing an approved closure plan in a permit for the empty vaults, as a means for terminating the regulatory identity of the GTF-DWMU.[10]

Applicable regulatory documentation

Action Memorandum for General Hanford Site Decommissioning Activities, DOE/RL-2010-22, Revision 0, March 29, 2010

Applicable Consent Decree or TPA milestones

Not applicable

RISK REVIEW EVALUATION INFORMATION

Completed

February 14, 2017

Evaluated by

Henry Mayer, Amoret Bunn, Jennifer Salisbury and Kevin Brown

Ratings/Impacts Reviewed by

Kathryn Higley

[9] US Department of Energy, Richland Operations Office*, Action Memorandum for General Hanford Site Decommissioning Activities*, DOE/RL-2010-22, Revision 0, March 29, 2010

[10] State of Washington Department of Ecology, letter to Hanford Office of River Protection and Richland Operations Office, Re: The Path Forward to Terminate the Grout Treatment Facility in Respect to the *Hanford Facility Dangerous Waste Permit* August 18, 2009.

PART III. SUMMARY DESCRIPTION

CURRENT LAND USE

Industrial

DESIGNATED FUTURE LAND USE

Pursuant to the 1999 Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS), the Central Plateau (200 Areas) geographic area is designated as Industrial-Exclusive (an area suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, nonradioactive wastes, and related activities).

PRIMARY EU SOURCE COMPONENTS

Legacy Source Sites

Approximately one million gallons of liquid phosphate-sulfate waste (PSW) from N Reactor was mixed with grout and disposed as a monolithic solid waste located in vault V-101 of the Grout Treatment Facility. The PSW was a low-level radioactive waste that contained source term radioactivity of 0.11mCi/L dominated by Co-60 (0.11mCi/L) and leachable Tc-99 (55 nCi/L) and Sr-90 (33 nCi/L). In terms of total alpha and total beta, it contained 7.79 nCi total alpha and 9,260 mCi total beta during the grouting campaign.[11] Negligible amounts of radiological contaminates are known to be present at other above and below ground areas of the EU.

Although the mapped area of this CP-LS-16 EU includes waste sites 216-A-37-1 (cribs) and 216-A-29 (ditch), they are not included in this risk review. The 216-A-37-1 site is associated with the 242-A Evaporator (CP-OP-10) and the 216-A-29 site is associated with the B Pond (CP-LS-11).

High-Level Waste Tanks and Ancillary Equipment

Not applicable

Groundwater Plumes

Not applicable

Operating Facilities

Not applicable

D&D of Inactive Facilities

Not applicable

LOCATION AND LAYOUT MAPS

The Grout Vaults Evaluation Unit (CP-LS-16) is located in the 200 Area, west of the Waste Treatment Plant (WTP).

[11] State of Washington, Department of Ecology, *Grout Treatment Facility Regulatory Closure Final Report*, July 2009

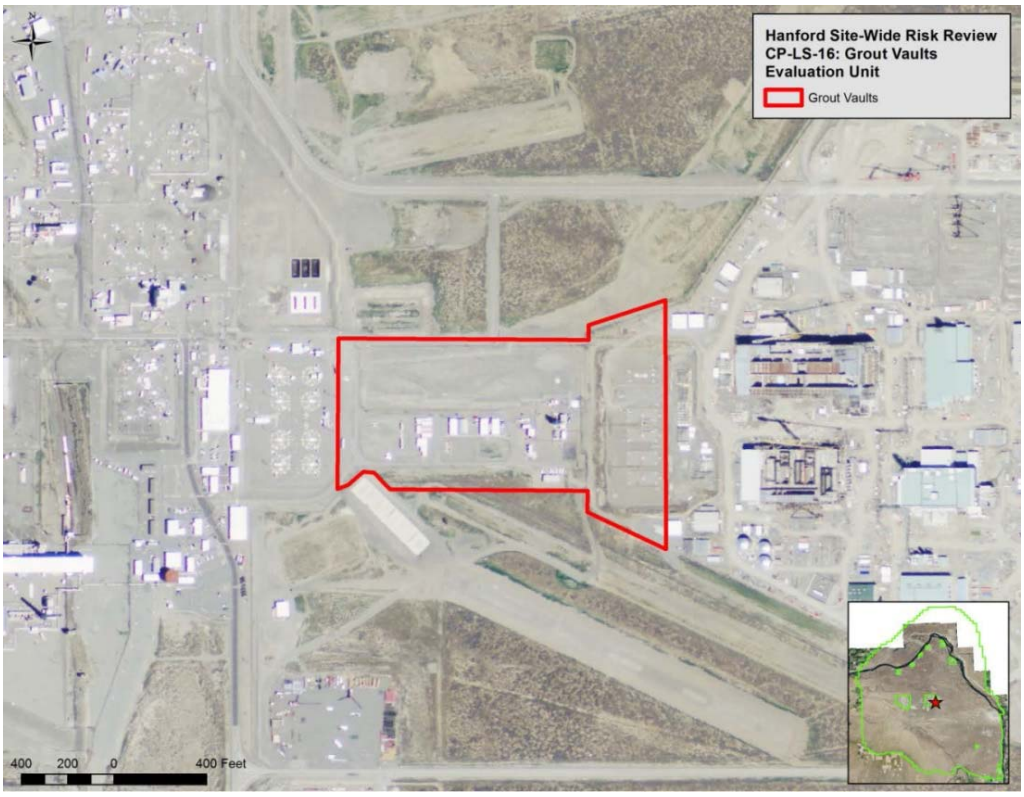


Figure G.10-1. Grout Vault EU.

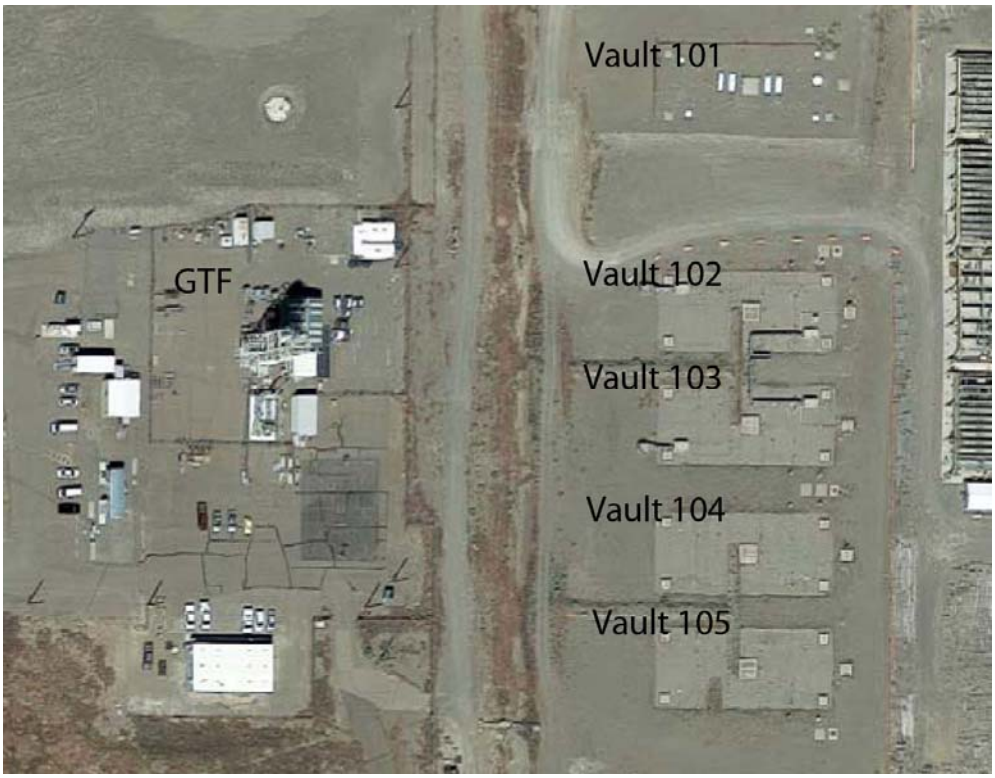


Figure G.10-2. Aerial View of Grout Vaults and Treatment Facility (Google Earth).

PART IV. UNIT DESCRIPTION AND HISTORY

EU FORMER/CURRENT USE(S)

In April 1988 a ROD was issued with regard to the disposal of the following defense wastes at the Hanford site: double-shell tank wastes, retrievably stored and newly generated transuranic (TRU) waste, the only pre-1970 buried suspect TRU-contaminated solid waste site outside the central (200 Area) plateau, and strontium and cesium encapsulated wastes. DOE's "Preferred Alternative" included the mixing of the low-activity fraction of wastes in the double shell tanks with a cement-based grout and disposal of the mixture in near surface pre-constructed, lined concrete vaults. This decision was based on DOE's "Final Environmental Impact Statement for the Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes'' (DOE/EIS-0113). Approximately 200 vaults were to be constructed specifically designed to meet long-term performance requirements and of RCRA and were to be covered by a protective barrier and marker system. To demonstrate the grouting concept and the mixture that would be stored in these vaults, the DOE grouted and disposed of approximately one million gallons of liquid phosphate-sulfate waste (PSW) in 1988-89. The PSW grout was disposed as a monolithic solid waste located in vault V-101 of the GTF.

In the early 1990s Washington State regulators and other stakeholders raised concerns about the grout's ability to prevent long-lived radionuclides, such as technetium-99, from migrating into groundwater over a long period, as well as the large land area (over 200 acres) that would be needed for the underground vaults. DOE suspended this effort and in 1994 it officially decided against the use of grout and chose to pursue vitrifying the low-activity tank wastes. Only four other underground vaults

were constructed between 1984 and 1988. None of them accepted or managed dangerous or mixed waste and they remain empty today. The Grout Treatment Facility (GTF) and other related buildings and equipment were abandoned in place.

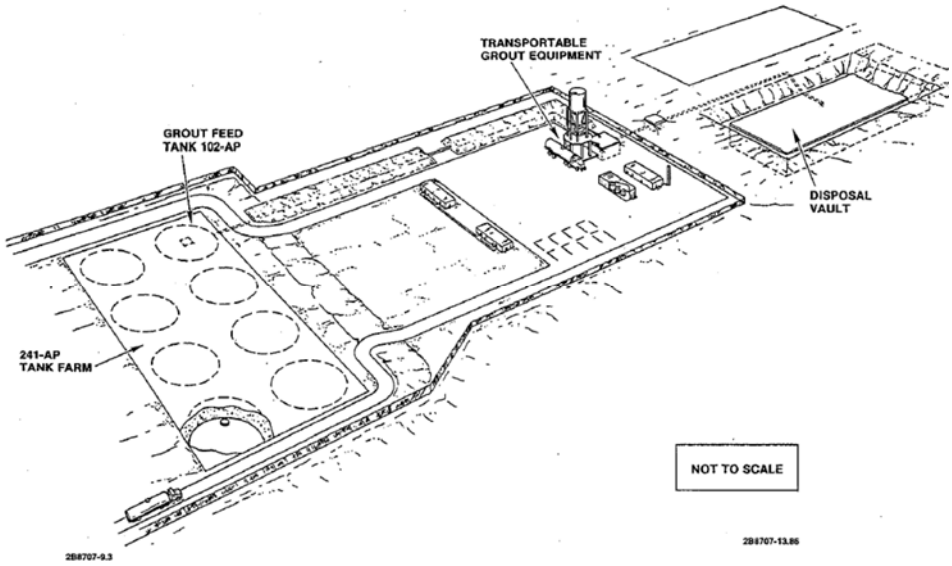


Figure G.10-3. Grout Treatment Facility Layout[12].

LEGACY SOURCE SITES

To demonstrate the grouting concept and the mixture that would be stored in these vaults, the DOE grouted and disposed of approximately one million gallons of liquid phosphate-sulfate waste (PSW) in 1988-89. The PSW grout was disposed as a monolithic solid waste located in vault V-101 of the GTF. No other wastes have been disposed of at this site.

GROUNDWATER PLUMES

Not applicable

D&D OF INACTIVE FACILITIES

Not applicable

ECOLOGICAL RESOURCES SETTING

Landscape Evaluation and Resource Classification

All of the resources within the Grout Vaults EU are classified as level 1 or lower (Appendix J, Table J.38).

The amount and proximity of biological resources surrounding the Grout Vaults EU were examined within the adjacent landscape buffer area, which extends 1683 ft (513 m) from the geometric center of the EU. Resource level 0 areas cover almost 54% of the buffer area (Appendix J, Table J.38) and include the future vitrification plant under construction on the east, and various waste sites and buildings within

[12] State of Washington Dangerous Waste Permit Application: Grout Treatment Facility, WA7890008967, October 1, 1999

the 200-East Area on the west (Apenidix J, Figure J.40). On the north and south sides of the buffer area are disturbed areas of level 1 resources dominated by Russian thistle surrounding isolated remnant patches of level 3 resources containing mature sagebrush (*Artemisia tridentata*) with an understory comprised of various introduced and native grasses and forbs.

Field Survey

Approximately 90% of the landscape encompassed by the Grout Vaults EU is bare ground and buildings associated with the facility; the remaining 10% occurs in 2 patches of disturbed habitat, one on the north and one on the south side of the EU. These two patches are dominated by Russian thistle (*Salsola tragus*) and cheatgrass (*Bromus tectorum*) (Appendix J, Table J.38). No birds or other animals were observed within the EU during the June 16, 2015 survey.

CULTURAL RESOURCES SETTING

An NHPA Section 106 review was completed for the installation of the facilities and infrastructure associated with CP-LS-16, Grout Vaults EU under HCRC#88-200-055 (Cadoret 1988). Five additional cultural resource inventory surveys have been conducted in portions of the EU, all with negative results. No cultural resources have been documented within the CP-LS-16, Grout Vaults EU. It is unlikely that intact archaeological material is present in the EU, which has been extensively disturbed by building and utilities construction.

Segments of the National Register-eligible Hanford Site Plant Railroad, a contributing property within the Manhattan Project and Cold War Era Historic District with documentation required are located within 500 meters of the EU. Additionally, 10 National Register-eligible buildings that are contributing properties within the Manhattan Project and Cold War Era Historic District are located within 500 meters of the EU (all 10 are contributing properties within the Manhattan Project and Cold War Era Historic District, 5 with individual documentation required, and 5 with no additional documentation required). All National-Register-eligible Manhattan Project and Cold War Era buildings have been documented as described in the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE/RL-97-56) (DOE-RL 1998).

Historic maps for this area do not indicate any cultural features within or near the EU. This suggests a low potential for archaeological resources associated with the Pre-Hanford Early Settlers/Farming Landscape to be present within the EU. Geomorphology indicates a very potential for the presence of archaeological resources associated with the Native American Precontact and Ethnographic Landscape to be present within the CP-LS-16, Grout Vaults EU. Further, extensive ground disturbance within the EU suggests little to no potential for intact cultural resources at or below ground surface.

Because portions of the EU have not been inventoried for cultural resources, it may be appropriate to conduct surface archaeological investigations in these areas prior to initiating any remediation activities. Indirect effects are always possible when TCPs are known to be located in the general vicinity. Consultation with Hanford Tribes (Confederated Bands of the Yakama Nation, Wanapum, Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce) and other groups associated with these landscapes (e.g. East Benton Historical Society, the Franklin County Historical Society and the Prosser Cemetery Association, the Reach, and the B-Reactor Museum Association) may be necessary to provide input on indirect effects to both recorded and potential unrecorded TCPs in the area and other cultural resource issues of concern.

PART V. WASTE AND CONTAMINATION INVENTORY

CONTAMINATION WITHIN PRIMARY EU SOURCE COMPONENTS

Legacy Source Sites[13]

To demonstrate the grouting concept and the mixture that would be stored in these vaults, the DOE grouted and disposed of approximately one million gallons of liquid phosphate-sulfate waste (PSW) in 1988-89. The PSW was N Reactor's decontamination waste and was chosen because it was a low-level radioactive waste that contained source term radioactivity of 0.11 mCi/L dominated by Co-60 (0.11mCi/L) and leachable Tc-99 (55 nCi/L) and Sr-90 (33 nCi/L). The chemical component of the waste stream was not considered a dangerous waste according to the requirements of the Washington Administrative Code (WAC) 173-303-070. The inventory amounts included in the Tables below were computed by multiplying these individual Ci/L values times the 3,785,400 liters of PSW that was transferred to Grout Vault 101 in 1988-89.

The vault constructed for the disposal of the PSW was the original design that had a reinforced concrete vaults with double High Density PolyEthylene (HDPE) liners to meet RCRA requirements but was not built to meet the requirement for additional barriers to control the release of long-lived soluble radioactive constituents to the soil column and groundwater. This is important because the PSW grout contains long-lived Tc-99, which is known to be in its highly mobile pertechnetate ion which easily leaches, and even in its immobile form is still leachable by diffusion controlled mechanism.

The GTF vaults design had a leachate collection system for periodic leachate removal. The leachate came from the curing of the grout. The leachates collected during grouting were managed by pumping them back to the 241-AP-102 tank. The PSW starting material contained 1.6 mg/L of chromium; however the leachate contained four times that amount of chromium (6.7 mg/L). No information is available with regard to the concentration or amount of chromium currently still present in the grout vault.

Vadose Zone Contamination

The reported inventories for CP-LS-16 (Table G.10-2 through Table G.10-4) are contained in the grout vaults that are considered isolated from the environment for the period of evaluation. Thus there is no reported vadose zone inventory to be evaluated.

Groundwater Plumes

Not applicable

[13] State of Washington, Department of Ecology, *Grout Treatment Facility Regulatory Closure Final Report*, Table 2, July 27, 2009

Table G.10-2. Inventory of Primary Contaminants [(a)]

WIDS	Description	Decay Date	Ref	Am-241 (Ci)	C-14 (Ci)	Cl-36 (Ci)	Co-60 (Ci)	Cs-137 (Ci)	Eu-152 (Ci)	Eu-154 (Ci)	H-3 (Ci)	I-129 (Ci)
All	Sum			NR	NR	NR	420	NR	NR	NR	NR	NR
GTFL	Burial Ground		See (b) below	NR	NR	NR	420	NR	NR	NR	NR	NR

a. NR = Not reported

b. The inventory amounts were computed by multiplying the individual Ci/L values referenced in State of Washington, Department of Ecology, *Grout Treatment Facility Regulatory Closure Final Report*, Table 2, July 27, 2009 times the 3,785,400 liters of PSW that was transferred to Grout Vault 101 in 1988-89.

Table G.10-3. Inventory of Primary Contaminants (cont)[(a)]

WIDS	Description	Decay Date	Ref	Ni-59 (Ci)	Ni-63 (Ci)	Pu (total) (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	U (total) (Ci)
All	Sum			NR	NR	NR	0.12	0.21	NR
GTFL	Burial Ground		See (b) below	NR	NR	NR	0.12	0.21	NR

a. NR = Not reported

b. The inventory amounts were computed by multiplying the individual Ci/L values referenced in State of Washington, Department of Ecology, *Grout Treatment Facility Regulatory Closure Final Report*, Table 2, July 27, 2009 times the 3,785,400 liters of PSW that was transferred to Grout Vault 101 in 1988-89.

Table G.10-4. Inventory of Primary Contaminants (cont)[(a)]

WIDS	Description	Ref	CCl4 (kg)	CN (kg)	Cr (kg)	Cr-VI (kg)	Hg (kg)	NO3 (kg)	Pb (kg)	TBP (kg)	TCE (kg)	U (total) (kg)
All	Sum		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
GTFL	Burial Ground	See (b) below	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

a. NR = Not reported

b. The inventory amounts were computed by multiplying the individual Ci/L values referenced in State of Washington, Department of Ecology, *Grout Treatment Facility Regulatory Closure Final Report*, Table 2, July 27, 2009 times the 3,785,400 liters of PSW that was transferred to Grout Vault 101 in 1988-89.

Table G.10-5. Summary of the Evaluation of Threats to Groundwater as a Protected Resource from Saturated Zone (SZ) and Remaining Vadose Zone (VZ) Contamination associated with the Evaluation Unit

PC	Group	WQS	Porosity[a]	K_d (mL/g)[a]	ρ (kg/L)[a]	VZ Source M^{Source}	SZ Total M^{SZ}	Treated[c] M^{Treat}	VZ Remaining M^{Tot}	VZ GTM (Mm^3)	VZ Rating[d]
C-14	A	2000 pCi/L	0.25	0	1.82	---	---	---	---	---	*ND*
I-129	A	1 pCi/L	0.25	0.2	1.82	---	---	---	---	---	*ND*
Sr-90	B	8 pCi/L	0.25	22	1.82	---	---	---	---	---	*ND*
Tc-99	A	900 pCi/L	0.25	0	1.82	---	---	---	---	---	*ND*
CCl4	A	5 µg/L	0.25	0	1.82	---	---	---	---	---	*ND*
Cr	B	100 µg/L	0.25	0	1.82	---	---	---	---	---	*ND*
Cr-VI	A	48 µg/L[b]	0.25	0	1.82	---	---	---	---	---	*ND*
TCE	B	5 µg/L	0.25	2	1.82	---	---	---	---	---	*ND*
U(tot)	B	30 µg/L	0.25	0.8	1.82	---	---	---	---	---	*ND*

a. Parameters obtained from the analysis provided in Attachment 6-1 to Methodology Report.

b. "Model Toxics Control Act—Cleanup" (WAC 173‑340) Method B groundwater cleanup level for hexavalent chromium.

c. Treatment amounts from the 2015 Hanford Annual Groundwater Report (DOE/RL-2016-09, Rev. 0).

d. Groundwater Threat Metric rating based on Table 6-3, Methodology Report.

PART VI. POTENTIAL RISK/IMPACT PATHWAYS AND EVENTS

CURRENT CONCEPTUAL MODEL

Pathways and Barriers

Briefly describe the current institutional, engineered and natural barriers that prevent release or dispersion of contamination, risk to human health and impacts to resources:

1. What nuclear and non-nuclear safety accident scenarios dominate risk at the facility? What are the response times associated with each postulated scenario?

No accident scenarios and related risks have been analyzed.

2. What are the active safety class and safety significant systems and controls?

Not applicable

3. What are the passive safety class and safety significant systems and controls?

Not applicable

4. What are the current barriers to release or dispersion of contamination from the primary facility? What is the integrity of each of these barriers? Are there completed pathways to receptors or are such pathways likely to be completed during the evaluation period?

PSW grout mixture was disposed as a monolithic solid waste located in vault V-101 of the GTF.

5. What forms of initiating events may lead to degradation or failure of each of the barriers?

No evaluation of initiating events has been conducted, but the only radiological contaminates are encased with grout as a monolith and contained in an underground concrete vault.

6. What are the primary pathways and populations or resources at risk from this source?

No evaluation has been conducted, but an evaluation by the State of Washington's Department of Ecology in 2009 found that the phosphate-sulfate waste (PSW) grout disposed of in the GTF vault "does not pose any immediate threat to human health and the environment."[14]

7. What is the time frame from each of the initiating events to human exposure or impacts to resources?

Not applicable

8. Are there current on-going releases to the environment or receptors?

None

POPULATIONS AND RESOURCES CURRENTLY AT RISK OR POTENTIALLY IMPACTED

Facility Worker

None, this is an inactive site.

[14] State of Washington Department of Ecology, letter to Hanford Office of River Protection and Richland Operations Office, Re: The Path Forward to Terminate the Grout Treatment Facility in Respect to the *Hanford Facility Dangerous Waste Permit* August 18, 2009.

Co-Located Person (CP)

None, this is an inactive site.

Public

None, this is an inactive site.

Groundwater and Columbia River

Reported vadose inventory information for the CP-LS-16 waste sites are associated with the grout vaults that are considered isolated from the environment for the period of this evaluation; thus there are no threats to groundwater or the Columbia River. The ratings for all Group A and B primary contaminants are *Not Discernible* (*ND*) (Table G.10-5).

Ecological Resources

- 100% of the EU is classified as level 1 or lower biological resources. Loss of the level 1 habitat within the EU during remediation activities is not expected to impact connectivity with surrounding habitats.
- Over 81% of the combined EU and adjacent landscape buffer area is classified at level 2 or lower.

Patches of level 3 resources in the adjacent buffer area are mostly shrub-steppe remnants that are isolated from similar habitat outside the 200-East Area.

Cultural Resources

The CP-LS-16, Grout Vaults EU is located within the 200-East Area of the Hanford Site, an area known to have low potential to contain Native American Precontact and Ethnographic archaeological resources and Pre-Hanford Early Settlers/Farming resources. Much of the 200 Areas were addressed in a cultural resources report entitled *Archaeological Survey of the 200 East and 200 West Areas, Hanford Site* (Chatters and Cadoret 1990). The focus of this archaeological survey was on inventorying all undisturbed portions of the 200-East and 200-West Areas. This report concluded that much of the 200-East and 200-West Areas can be considered areas of low archaeological potential with the exception of intact portions of an historic/ethnohistoric trail/road corridor which runs through the 200-West Area.

It appears that a NHPA Section 106 review was completed for the CP-LS-16, Grout Vaults EU under HCRC#88-200-055 (Cadoret 1988). This review did not find cultural resources within the EU, and concluded that it is unlikely that intact archaeological materials could be present (both on the surface and in the subsurface), because the soils in the CP-LS-16, Grout Vaults EU have been extensively disturbed by Hanford Site activities. Additional portions of the CP-LS-16, Grout Vaults EU have been inventoried for archaeological resources under five cultural resource reviews: HCRC#87-200-002 (Chatters 1987a), HCRC#87-200-046 (Chatters 1987b), HCRC#92-600-007 (Chatters et al. 1993), HCRC#96-200-109 (Cadoret 1996), and HCRC#2008-200-017 (Kennedy 2008). None of these cultural resource reviews resulted in the identification of any cultural resources within the EU.

Archaeological sites, buildings and Traditional Cultural Properties (TCPs) located within the EU[15]

[15] Traditional cultural property has been defined by the National Park Service as "a property, a place, that is eligible for inclusion on the National Register of Historic Places because of its association with cultural practices and beliefs that are (1) rooted in the history of a community, and (2) are important to maintaining the continuity of that community's traditional beliefs and practices" (Parker & King 1998).

- There are no known archaeological sites, inventoried historic buildings, or TCPs located within the CP-LS-16, Grout Vaults EU.

Archaeological sites, buildings and TCPs located within 500 meters of the EU

- Segments of the National Register-eligible Hanford Site Plant Railroad, a contributing property within the Manhattan Project and Cold War Era Historic District, with documentation required, are located within 500 meters of the CP-LS-16, Grout Vaults EU. In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan (*DOE/RL-97-56) (DOE-RL 1998), all documentation requirements have been completed for this property.
- There are 10 National Register-eligible buildings that are contributing properties within the Manhattan Project and Cold War Era Historic District within 500-meters of the CP-LS-16 Grout Vaults EU (all 10 are contributing properties within the Manhattan Project and Cold War Era Historic District, 5 with individual documentation required, and 5 with no additional documentation required). In accordance with the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan (*DOE/RL-97-56) (DOE-RL 1998), all documentation requirements have been completed for these properties.

Appendix K, Table K.24, contains more information about the 10 buildings that are National Register-eligible Manhattan Project and Cold War Era buildings located within 500-meters of the CP-LS-16 Grout Vaults EU.

Closest Recorded TCP

There are two recorded TCPs associated with the Native American Precontact and Ethnographic Landscape that are visible from the CP-LS-16, Grout Vaults EU.

CLEANUP APPROACHES AND END-STATE CONCEPTUAL MODEL

Selected or Potential Cleanup Approaches

According to DOE/RL-2010-22[16] the proposed remedial action program for facilities of this type includes D4 of the excess buildings/structures, cleanup of debris, and packaging and shipping the associated waste to ERDF or other approved onsite or offsite disposal facility for treatment, as needed, and disposal. Demolition of building and structures will include removal of above grade structures. If below grade structures (including pipes and utility systems) are not contaminated or may be decontaminated, they will optionally be left in place, backfilled, and brought to grade. This description would appear to include all five underground grout vaults. Backfill will consist of clean fill materials and/or inert demolition waste from the above grade structures.

Not specific to this site, there is potential for encountering contamination in surrounding soils during the course of decommissioning work. Soil that is contaminated with substances that are known or easily determined to be associated with normal building/structure operation or maintenance will be removed for disposal during building/structure demolition if practicable.

Contaminant Inventory Remaining at the Conclusion of Planned Active Cleanup Period

Assuming that the above cleanup method is used, there will be negligible above ground contamination remaining. Underground vault V-101 will still contain approximately one million gallons of liquid

[16] US Department of Energy, Richland Operations Office*, Action Memorandum for General Hanford Site Decommissioning Activities*, DOE/RL-2010-22, Revision 0, March 29, 2010.

phosphate-sulfate waste (PSW) from N Reactor that was mixed with grout and disposed as a monolithic solid waste.

Risks and Potential Impacts Associated with Cleanup

No evaluation of risks or impacts during cleanup has been prepared.

POPULATIONS AND RESOURCES AT RISK OR POTENTIALLY IMPACTED DURING OR AS A CONSEQUENCE OF CLEANUP ACTIONS

Facility Worker

No evaluation of risks or impacts during or as a consequence of cleanup has been prepared.

Co-located Person

No evaluation of risks or impacts during or as a consequence of cleanup has been prepared.

Public

No evaluation of risks or impacts during or as a consequence of cleanup has been prepared.

Groundwater

Not applicable

Columbia River

Not applicable

Ecological Resources

Disposal at ERDF involves car and pickup truck traffic through the non-target and target (remediation) area, truck and heavy equipment traffic on roads through the non-target and target area, soil removal and contamination in the soil, dust suppression, vegetation control, and irrigation (for revegetation) will cause the following disturbance from remediation activities: Carry seeds or propagules (pieces of vegetation or other biological parts that can grow and/or reproduce) on tires of vehicles or blowing from heavy equipment; injure or kill vegetation or small invertebrates or small animals; vehicle traffic can make paths, compact soil, scare or displace animals, can impact animal behavior or reproductive success; affect animal dispersion and habitat use (e.g., some birds avoid nesting near roads because of song masking); displacement of animals from near roads due to increased noise or other disturbances; and heavy equipment may permanently destroy areas of the site with intense activity. During remediation, radionuclides or other contaminants could be released or spilled on the surface, and depending upon the type and quantity, could have adverse effects on the plants and animals on-site. Additional water from dust suppression could lead to more diverse and abundant vegetation in areas that receive water, which could encourage invasion of exotic species; the latter could displace native plant communities; excessive dust suppression activities could lead to compaction, which can decrease plant growth in those areas, decrease abundance and diversity of soil invertebrates, and prevent fossorial snakes or mammals from using the area. Use of non-specific herbicides for vegetation control results in some mortality of native vegetation (especially native forbes), and allows exotic species to move in; it may change species composition of native communities, but it also could make it easier for native species to move in; improved methods could yield positive results. Irrigation requires a system of pumps and water, resulting in physical disturbance; repeated irrigation from the same locations could result in some soil compaction, which can decrease plant growth in those areas, decrease abundance

and diversity of soil invertebrates, and prevent fossorial snakes or mammals from using the area. These effects will be higher in the EU itself.

Cultural Resources

Potential direct effects are possible from personnel, car, pick-up, truck and heavy equipment traffic/use through both target (remediation) and non-target areas during active cleanup. These activities may inadvertently expose resources close to the surface. Additionally, traffic through these areas may lead to the introduction of invasive species and/or a decrease in the presence of native plants used for medicinal or tribal religious purposes. Heavy equipment use for remedial activities (such as remediation of sub/below grade structures and contiguous contaminated soil sites) may lead to an alteration of the landscape, and the act of soil removal may destroy resources; if resources are not destroyed, then, soil removal may disturb or adversely affect resources. Lastly, during remediation, radionuclides or other contamination released or spilled on the surface could have long-term effects if the contamination remains and resources become contaminated and/or plants having cultural importance to Tribes do no recolonize or thrive.

Potential indirect effects are possible from personnel traffic through target (remediation) areas as well as car, pick-up, truck and heavy equipment traffic/use through both target (remediation) and non-target areas. It is possible that these activities may decrease viewshed values and/or impact viewshed through the introduction of increased dust, the creation of trails, etc. Heavy equipment use for remedial actions could potentially cause alterations to the landscape and impacts to viewsheds. Lastly, during remediation, radionuclides or other contamination released or spilled on the surface could have long-term effects if the contamination remains and resources become contaminated and/or plants having cultural importance to Tribes do no recolonize or thrive.

Additional Risks and Potential Impacts if Cleanup is Delayed

This site has been inactive since the early 1990s, and no information is available that indicates that a delay in cleanup will have any impact.

Near-Term, Post-Cleanup Status, Risks and Potential Impacts

No evaluation of risks or impacts post-cleanup has been prepared, but because the radiological contaminates will remain as a grout encased monolith in underground vault V-101 there should be no risk or impact to human health post-cleanup.

POPULATIONS AND RESOURCES AT RISK OR POTENTIALLY IMPACTED AFTER CLEANUP ACTIONS (FROM RESIDUAL CONTAMINANT INVENTORY OR LONG-TERM ACTIVITIES)

Table G.10-6. Summary of Populations and Resources at Risk or Potentially Impacted after Cleanup.

Population or Resource		Risk/Impact Rating	Comments
Human	Facility Worker	ND	
	Co-located Person	ND	
	Public	ND	
Environmental	Groundwater	*Not Discernible* (*ND*)	Reported inventories are in grout vaults assumed isolated from the environment.
	Columbia River	*ND*	
	Ecological Resources[a]	Low to Medium	Monitoring activities for post-closure conditions are expected to occur. Medium impacts are likely if structures remain in place, inhibiting the recovery of resources.
Social	Cultural Resources[a]	**Native American** Direct: Unknown Indirect: Known **Historic Pre-Hanford** Direct: Unknown Indirect: None **Manhattan/Cold War** Direct: None Indirect: Unknown	Permanent direct effects are possible if residual contamination remains after remediation. National Register eligible Manhattan Project/Cold War Era significant resources located within the EU and 500 meters of the EU, some will be demolished, but they have already been mitigated.

a. For both Ecological and Cultural Resources see Appendices J and K, respectively, for a complete description of Ecological Field Assessments and literature review for Cultural Resources. Ecological ratings are described in Table 4-11 of the Final Report.

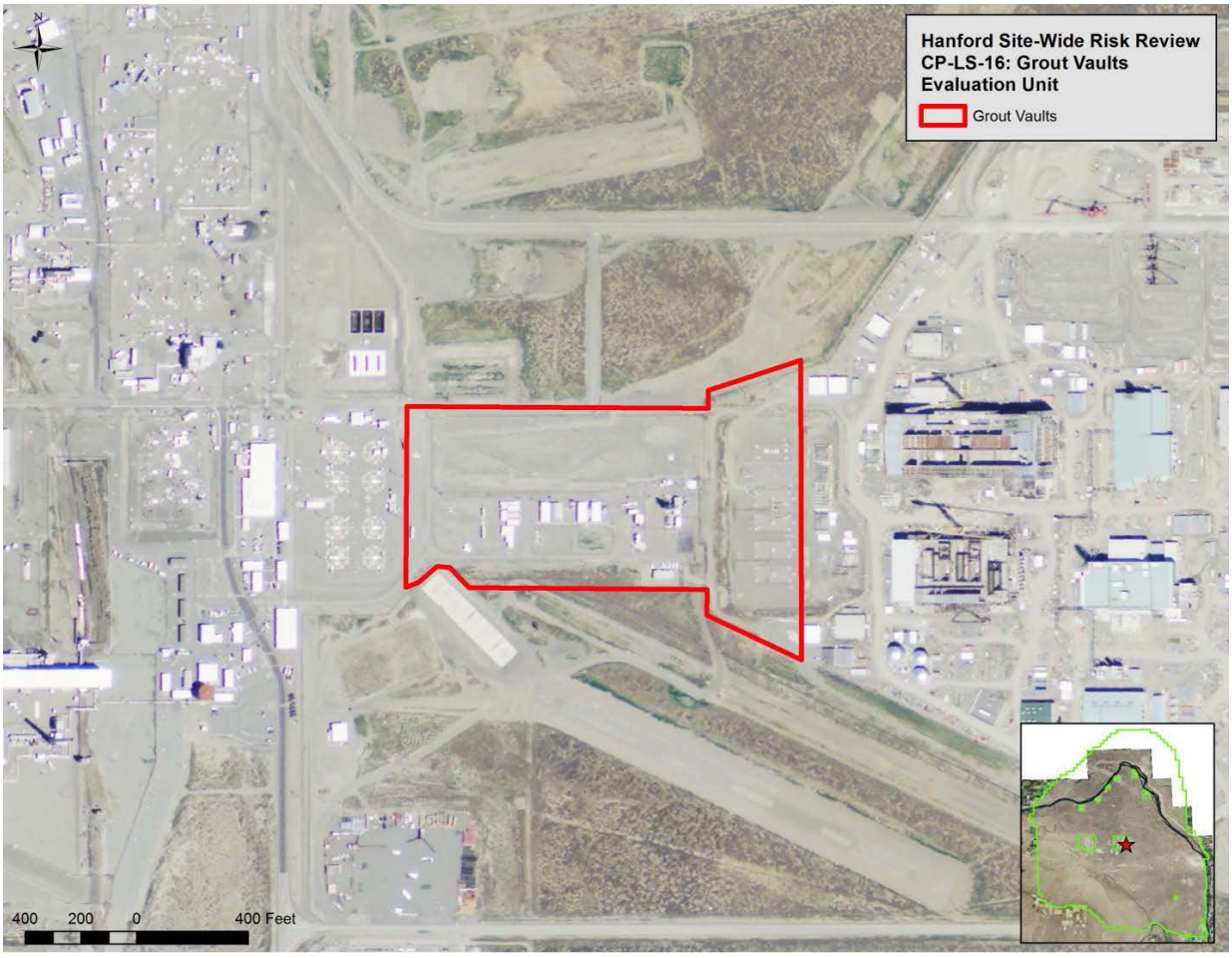
LONG-TERM, POST-CLEANUP STATUS – INVENTORIES AND RISKS AND POTENTIAL IMPACT PATHWAYS

No evaluation of risks or impacts post-cleanup has been prepared, but because the radiological contaminates will remain in as a grout encased monolith in underground vault V-101 there should be no risk or impact to human health long-term post-cleanup.

PART VII. SUPPLEMENTAL INFORMATION AND CONSIDERATIONS

Hanford Site-Wide Risk Review

Evaluation Unit:	Grout Vaults
ID:	CP-LS-16
Group:	Legacy Source
Operable Unit Cross-Walk: NA	
Related EU: NA	
Sites & Facilities:	Grout vaults located west of WTP.
Key Data Sources Docs:	Analysis of RCRA Closure for Grout Vaults 102, 103, 104, and 105 (WHC-SD-WM-PLN-049_Rev0)



CP-LS-16 (Grout Vaults) Site Location Map

Waste Site and Facility List

Site Code	Name, Aliases, Description	Feature Type	Site Status	ERS Classification	ERS Reclassification	Site Type	Site Type Category	Operable Unit	Exclude from Evaluation	Comments
GTFL	GTFL; PSW Vault; 218-E-16; Grout Treatment Facility Landfill; GTF Vaults	Waste Site	Inactive	Accepted	None	Burial Ground	Burial Ground	Not Applicable		
216-A-37-1	216-A-37-1; 216-A-37 Crib	Waste Site	Inactive	Accepted	None	Crib	Crib - Subsurface Liquid Disposal Site	200-EA-1		
200-E-289-PL	200-E-289-PL; Lines 637, SN-700 and SN-701; Pipelines between AP-02D Pit and WTP	Waste Site	Inactive	Accepted	None	Direct Buried Tank Farm Pipeline	Pipeline and associated valves, etc.	TBD		
216-A-29	216-A-29; 216-A-29 Ditch; A-29 Ditch; Snow's Canyon	Waste Site	Inactive	Accepted	None	Ditch	Pond/Ditch – Surface Liquid Disposal Site	200-EA-1		
GTF	GTF; Grout Treatment Facility	Waste Site	Inactive	Accepted	None	Process Unit/Plant	Process Building	Not Applicable		
200-E-127-PL-B	200-E-127-PL-B; Segments of Gable Mountain Pond Pipeline Located in the Inner Area	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200-IS-1		
200-E-187-PL	200-E-187-PL; Chemical Sewer from 202-A to 216-A-29 Ditch; Lines 8819, 5802 and 5701; PUREX Chemical Sewer (CSL)	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200-IS-1		
200-E-232-PL	200-E-232-PL; Pipeline from 207-A Basins to 216-A-30 and 216- A-37-1 Cribs	Waste Site	Inactive	Accepted	None	Radioactive Process Sewer	Pipeline and associated valves, etc.	TBD_200-IS-1		
200-E-286	200-E-286; A Swamp; A-Swamp and Ditch; Original 200 East Area Powerhouse Effluent Pond; Powerhouse Swamp	Waste Site	Inactive	Accepted	Rejected	Pond	Pond/Ditch – Surface Liquid Disposal Site	Not Applicable	X	Rejected
2607-E10	2607-E10	Waste Site	Active	Accepted	None	Septic Tank	Septic System	Not Applicable	X	Septic System
243G1A	GROUT PROCESSING FACILITY MOTOR PIT	Facility	INACTIVE			BUILDING	Infrastructure Building			
243G6	GPF ELECTRICAL EQUIPMENT ROOM	Facility	INACTIVE			BUILDING	Infrastructure Building			
243G81	WATER SERVICE BUILDING	Facility	INACTI			BUILDING	Infrastructure Building			

			VE							
216A42E	DIVERSION BOX FOR 216A42 DITCH	Facility	INACTIVE			STRUCTURE	Pipeline and associated valves, etc.			
243G1	GROUT PROCESSING FACILITY (GPF) MIX-PUMP MODULE	Facility	INACTIVE			STRUCTURE	Infrastructure Building			
243G2	GPF DRY BLEND HANDLING AND FEED MODULE	Facility	INACTIVE			STRUCTURE	Infrastructure Building			
243G3	GPF ADDITIVES MODULE	Facility	INACTIVE			STRUCTURE	Infrastructure Building			
243G4	GPF CONTROL ROOM MODULE	Facility	INACTIVE			STRUCTURE	Infrastructure Building			
243G5	TRANSPORTABLE GROUT EQUIPMENT STANDBY GENERATOR	Facility	INACTIVE			STRUCTURE	Infrastructure Building			
243G8	GROUT PROCESSING FACILITY FILTRATION MODULE	Facility	INACTIVE			STRUCTURE	Infrastructure Building			
243G9	GPF ELECTRICAL SUBSTATION GROUT	Facility	INACTIVE			STRUCTURE	Infrastructure Building			
MO041	MOBILE OFFICE AT 243G IT SHOP	Facility	ACTIVE			BUILDING	Infrastructure Building		X	Mobile Office
MO282	MOBILE OFFICE AT GROUT	Facility	ACTIVE			BUILDING	Infrastructure Building		X	Mobile Office
MO283	MOBILE OFFICE AT GROUT	Facility	ACTIVE			BUILDING	Infrastructure Building		X	Mobile Office
MO284	MOBILE OFFICE AT GROUT	Facility	ACTIVE			BUILDING	Infrastructure Building		X	Mobile Office
MO997	MOBILE OFFICE AT 243G OLD GROUT SITE	Facility	ACTIVE			BUILDING	Infrastructure Building		X	Mobile Office
241AP	WASTE STORAGE TANK FARM NEAR PUREX	Facility	ACTIVE			OTHER	Underground Storage Tank		X	Included in 200-E DSTs Eval.

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