DOE/RL-2020-11
Draft A

Action Memorandum for the Interim Stabilization of 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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Signature Page

Having considered the extent to which the *Action Memorandum for the Interim Stabilization of 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank* could be inconsistent with *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* processes, or could alter schedules set forth in Appendix D of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), the U.S. Department of Energy approves this document.

William F. Hamel, Jr. U.S. Department of Energy Richland Operations Office	Signature	Date

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Concurrence Page

Title: *Action Memorandum for the Interim Stabilization of 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank*

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Emerald Laija U.S. Environmental Protection Agency	Signature	Date

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Contents

Appendices

Figures

Tables

Terms

AM	action memorandum
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act of 1980*
DOE-RL	U.S. Department of Energy, Richland Operations Office
NCP	National Contingency Plan
OU	operable unit
PFP	Plutonium Finishing Plant
RD/RAWP	remedial design/remedial action work plan
ROD	record of decision
SARA	*Superfund Amendments and Reauthorization Act of 1986*
TCRA	time-critical removal action

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1 Purpose

This action memorandum (AM) documents approval of the time-critical removal action (TCRA) to support the interim stabilization of the 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank (hereinafter collectively referred to as the Z Belowgrade Structures), which will be stabilized using engineered grout. The Z Belowgrade Structures are part of a waste site in the 200 West Area within the 200-PW-1 Operable Unit (OU).

The purpose of this removal action is to provide interim stabilization of the belowgrade structures and is proposed to occur before the remedial action to prevent a potential subsidence event and release of contamination that could affect human health and the environment. Approval of this AM authorizes stabilization of the Z Belowgrade Structures under authority of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA).

This AM was prepared in accordance with CERCLA as amended by the *Superfund Amendments and Reauthorization Act of 1986* (SARA); Executive Order 12580, *Superfund Implementation*; and 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan" (hereinafter referred to as the National Contingency Plan [NCP]). This removal action supports the overall cleanup objectives specified in Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order* (hereinafter referred to as the Tri-Party Agreement), as revised. The AM has also been prepared to meet the intent of EPA, 2009, *Superfund Removal Guidance for Preparing Action Memoranda*. The performance of this removal action will place the structures into a configuration that is protective of human health and the environment. Without remediation of these structures, a potential threat for release of hazardous substances exists; without action, adverse threats to human health and the environment eventually could occur.

Along with the 200-CW-5, 200-PW-3 and 200-PW-6 OUs, a remedial action for the 200-PW-1 OU is specified in EPA et al., 2011, *Record of Decision: Hanford 200 Area Superfund Site 200-CW-5 and 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units, Hanford Site, Benton County, Washington* (hereinafter referred to as the 200-PW 1/3/6, 200-CW-5 record of decision [ROD]). The removal action for the Z Belowgrade Structures as described in this decision document will not preclude the remedial action for the 200-PW-1 OU nor will it alter the schedules set forth in Appendix D of Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*.

The U.S. Department of Energy, Richland Operations Office (DOE-RL) is the lead agency responsible for performing the removal action. The Z Belowgrade Structures TCRA consists of stabilizing the belowgrade structures by filling void space with engineered grout.

Attached to this decision document are the following appendices that provide requirements and detailed instructions to support the field stabilization activities.

- Appendix A – Removal Action Stabilization Plan
- Appendix B – Waste Management Plan
- Appendix C – Air Monitoring Plan

2 Facility Description and Background

This chapter provides a brief description of the site, including an overview of the Z Belowgrade Structures operational history and a summary of contaminants.

2.1 Facility Description

The Hanford Site encompasses approximately 586 mi^2 in southeastern Washington State north of the confluence of the Columbia, Yakima, and Snake Rivers. The Columbia River flows east through the northern part of the Hanford Site and, turning south, forms the eastern boundary of the site. The Yakima River runs along part of the southern boundary and joins the Columbia River at the City of Richland, which bounds the Hanford Site on the southeast (Figure 1).

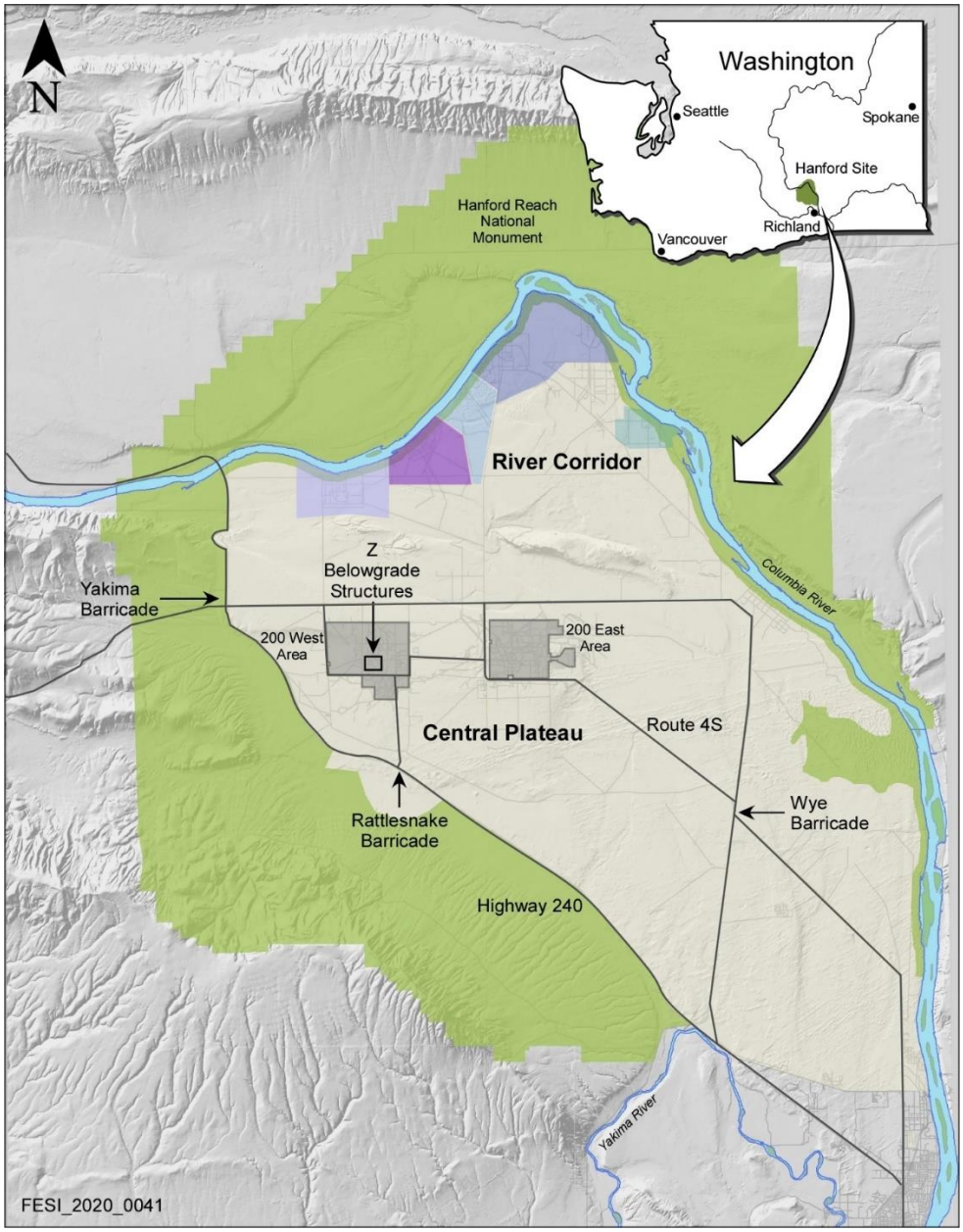

Figure 1. Z Belowgrade Structures Within the Hanford Site

The structures in the scope of this TCRA are located within the Plutonium Finishing Plant (PFP) Implementation Area in the 200 West Area of the Hanford Site (Table 1; Figure 2). The TCRA includes the 241Z361 Waste Settling Tank – underground structure, 216Z9 Recuplex Contaminated Soil Removal Building, and the belowgrade structure associated with 216-Z-2 waste site. The closest remaining non-operational abovegrade support structures are 216Z9A Contaminated Soil Removal Building and 216Z9B Mining Operator Cubicle, but these are not included in the scope of this removal action.

Table 1. Z Belowgrade Structures in the Scope of this TCRA

Structure Identification	Structure/Waste Site Name
241Z361	Waste Settling Tank – Underground
216Z9	Recuplex Contaminated Soil Removal Building
N/A	Wooden Crib structure associated with 216-Z-2 waste site

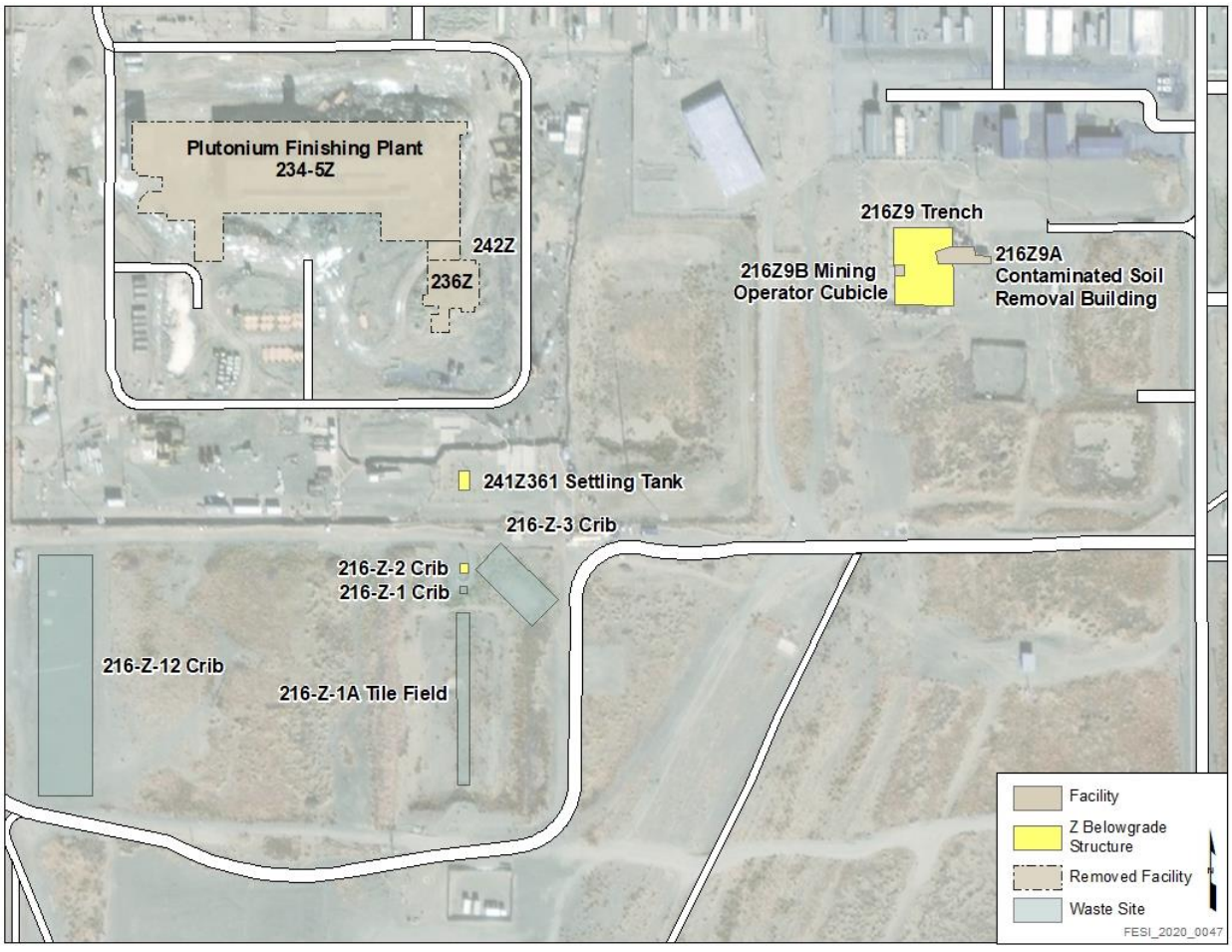

Figure 2. Location of 216-Z-2 Crib, 216Z9 Trench, and 216241Z Settling Tank

2.1.1 216-Z-2 Crib

The 216-Z-2 Crib is located south of the former 234-5Z Building north of the 216-Z-1A Tile Field and 216-Z-1 Crib, and west of the 216-Z-3 Crib. The crib is a 12 ft square and 14 ft tall open-bottom wooden box constructed in an excavation that was 14 ft square at the bottom and 21 ft deep. The open joints in the sides and top of the crib were caulked, and the upper half of the crib was lagged with 0.75 in. thick plywood to control intrusion of sand into the structure. Two risers are visible from the surface of the crib: one is a filtered vent, and the other is an 8 in. diameter steel test well. The well was installed as part of the original construction and extended 20 ft beyond the base of the timber structure to a total depth of 41 ft below ground surface (bgs). The surface elevation of the crib is approximately 679.8 ft. Groundwater is approximately 235.1 ft bgs based on a measurement from a nearby well in 2008.

From 1949 to 1969, the 216-Z-2 and 216-Z-1 Cribs were operated as one unit. The 216-Z-2 Crib overflowed into the 216-Z-1 Crib, which then overflowed into the 216-Z-1A Tile Field. The 216-Z-1 and 216-Z-2 Cribs are 18 ft apart and connected and fed by an 8 in. diameter stainless steel pipe with an outlet pipe to the 216-Z-1A Tile Field. Figure 3 illustrates the 216-Z-2 Crib in relation to other surrounding waste sites.

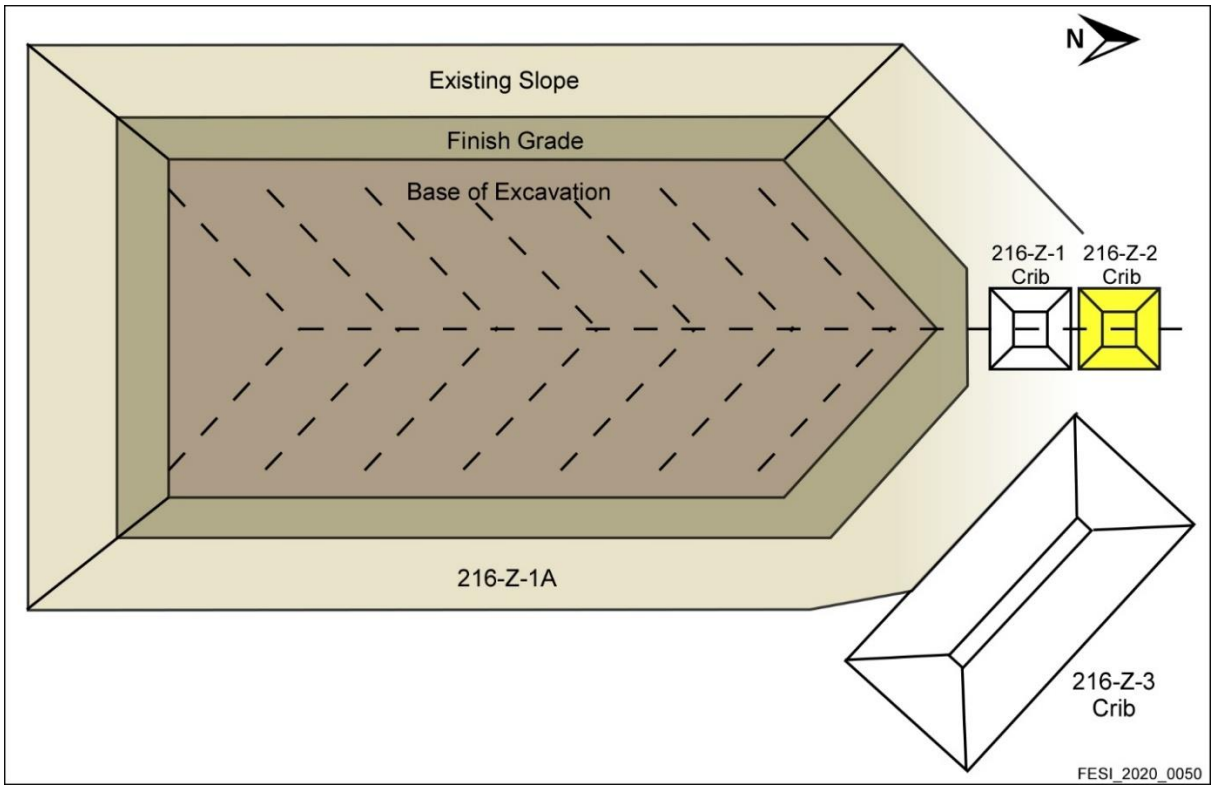

Figure 3. 216-Z-2 Crib and Surrounding Waste Sites

Between 1949 and 1952, the cribs received PFP low-salt waste consisting of basic (pH 8 to 10) process waste and analytical and development laboratory waste from the 234-5Z Building via the 241Z361 Settling Tank. The cribs were taken out of service in 1952 when the liquid volume sent to the cribs exceeded their infiltration capacity. The cribs were again used for two brief periods between 1966 and 1967. During these periods, the cribs received very small quantities of high-salt waste directly from the Plutonium Recovery Facility in the 236Z Building and the Waste Treatment and Americium Recovery Facility in the 242Z Building. Insignificant volumes of organics were discharged to the cribs during these

short periods of time. In 1968, the cribs received uranium wastes directly from the 236Z Building. This activity was the final use of the cribs, and in 1969, the cribs were administratively closed. The cribs were physically isolated when the inlet pipe was cut and blanked.

Over their lifetime, the cribs received over 10 million gallons of effluent, roughly 13 times the estimated soil pore volume between the base of the cribs and the current water table. An estimated 7 kg of plutonium and 220,000 lb of nitrate were discharged to the cribs. No data were available regarding the volume, concentration, or distribution of other nonradiological contaminants in the soils at the cribs. The quantity of discharged nitrate and the volume of effluent suggested that the cribs were the contributing sources to nitrate contamination in the unconfined aquifer in the past.

Based on the investigation data, the majority of the plutonium and americium contaminant mass is contained between ground surface and 31 ft bgs, with the highest activities found near the base of the cribs.

2.1.2 216Z9 Trench

The 216Z9 Trench is about 700 ft east of the 234-5Z Building. The trench is a 20 ft deep open excavation, 30 by 60 ft at the bottom and 90 by 120 ft at the top (Figure 4). A concrete roof covers the trench and is supported by six concrete columns. The underside of the concrete cover was paved with acid-resistant brick/tiles (Figure 5). The trench floor has a slight slope to the south. The surface elevation at the site is approximately 664 ft. Groundwater is approximately 226 ft bgs based on a 2008 well measurement.

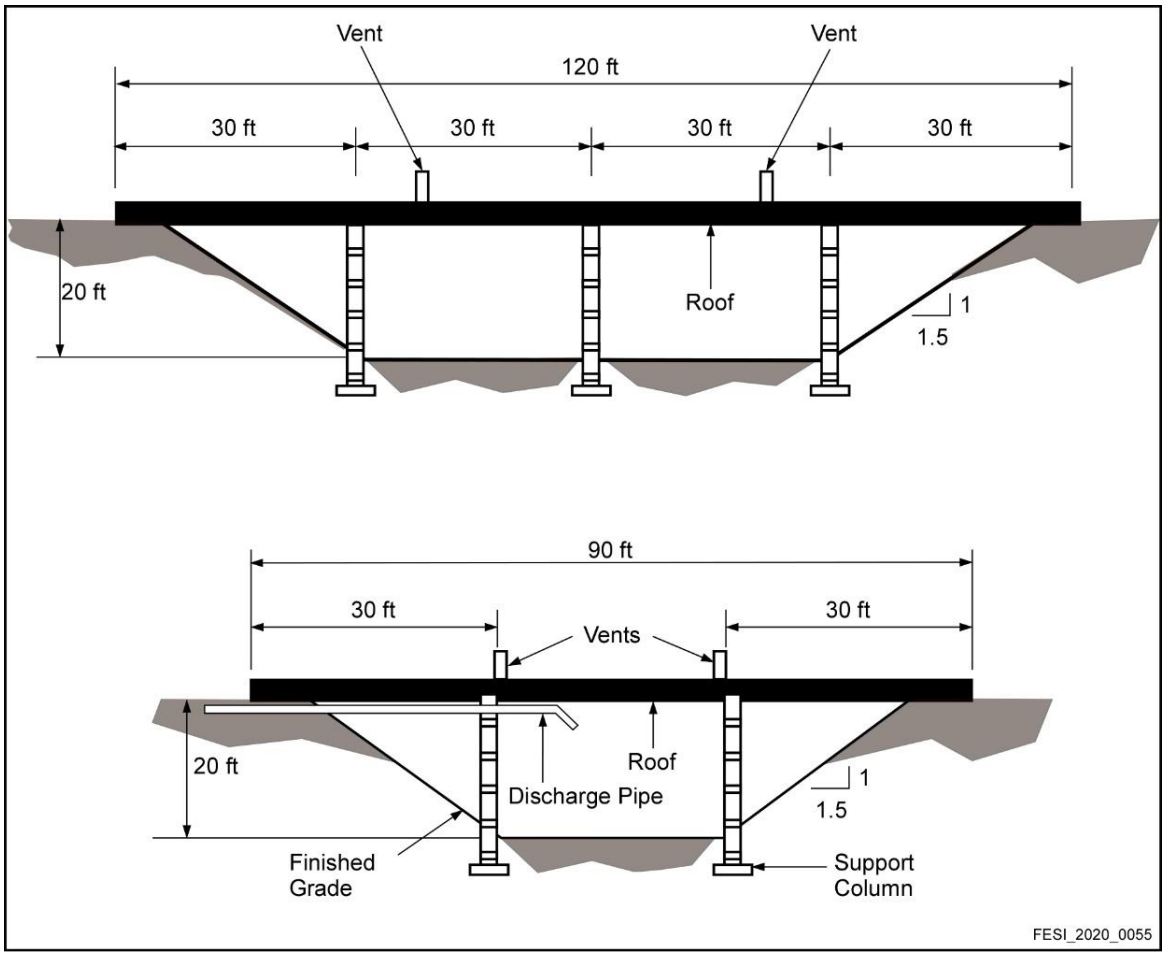

Figure 4. 216Z9 Trench

Figure 5. Internal View of the 216Z9 Trench

More than a million gallons of plutonium/organic rich process wastes were discharged to the 216Z9 Trench between 1955 and 1962. When the 216Z9 Trench was retired in 1962, it had received approximately 50 to 150 kg of plutonium. Mining to remove plutonium took place in 1976 and 1977, when the top 1 ft of soil was removed from the trench floor. The mining operation removed an estimated 58 kg of plutonium. Based on data acquired during the mining operation, an estimated 38 to 48 kg of plutonium remains in the trench. Currently, the trench cavity contains only the mining equipment.

The total discharged effluent to the 216Z9 Trench exceeded the capacity of the soil column, which indicates that the volume of effluent released was sufficient to reach the unconfined aquifer during operational years. The data however indicate that the 216Z9 Trench is currently not a significant source of groundwater contamination based on low soil moisture content.

An investigation for carbon tetrachloride vapor in the vadose zone in the vicinity of the 216Z9 Trench was conducted in the early 1990s. Soil vapor samples collected from boreholes near the trench revealed a quantity of dense, nonaqueous phase liquid in the soil between 380,000 µg/kg and 390,000 µg/kg. As a result, a soil vapor extraction system was deployed, and between March 1993 and September 2008, approximately 120,390 lbs of carbon tetrachloride was removed from the trench.

2.1.3 241Z361 Settling Tank

The 241Z361 Settling Tank is an underground reinforced concrete structure with a steel liner and a sloped bottom. The tank's outer dimensions are 28 by 15 ft , and the height varies between 18 and 19 ft (Figure 6). The internal dimensions are 26 by 13 ft, and the height varies between 17 and 18 ft. The tank has 1 ft thick concrete walls in all directions. The top of the tank is 2 ft belowgrade. A 6-in. stainless steel inlet pipe from the 241Z Tank Pit enters the tank from the north. A single horizontal 8-in. diameter stainless steel pipe exits the tank from the south. Two manhole covers, support frames, and several risers are visible abovegrade.

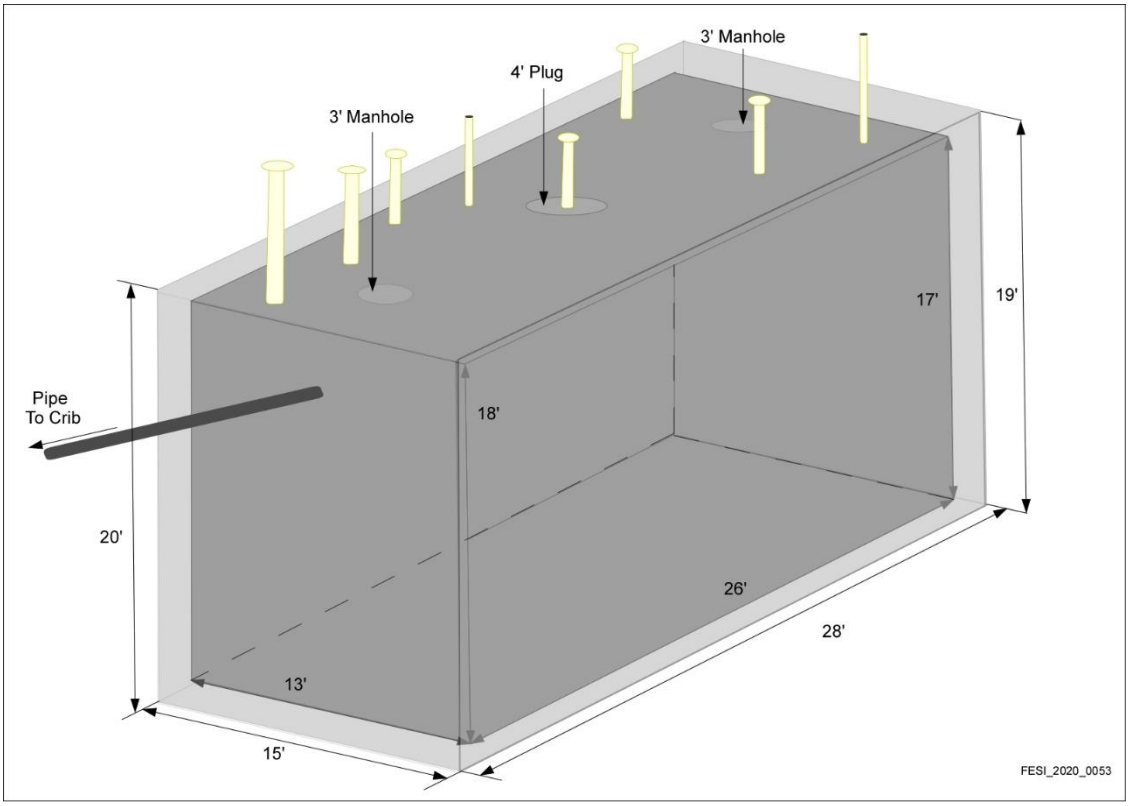

Figure 6. 241Z361 Settling Tank

The tank served as the primary solids settling tank for low-salt liquid waste from the 234-5Z, 236Z, and 242Z Buildings from 1949 to 1973. The liquid waste was neutralized in the 241Z sump tanks by adding fly ash and later sodium hydroxide to raise the pH prior to discharging waste to the tank. Supernatant effluent in the tank was discharged to the 216-Z-1 and 2, 216-Z-3, and 216-Z-12 Cribs.

The 241Z361 Settling Tank was taken out of service in May 1973 when discharge of contaminated waste streams to the ground from PFP was discontinued as a matter of policy. The following significant findings are summarized for the Settling Tank:

- The remaining liquid waste was removed, leaving a sludge layer in the settling tank. About 200 gal of liquid remain in pools on top of the sludge layer.
- Approximately 19,800 gal of sludge remains in the tank (about half of the tank capacity) containing 26 to 75 kg of plutonium. The sludge is contaminated with radionuclides (primarily plutonium-239), metals, organics, and polychlorinated biphenyls.
- Helical piers installed to support tank sampling were surveyed when removed. No radiological contamination was detected.
- The lack of detected radiological contamination on the piers installed beneath the depth of the tank bottom and the apparent stability in the tank sludge level since 1975 suggest that there has been no leak of tank contents to the soil column.
- Available information indicates the 241Z361 Settling Tank has not leaked; thus, this site is not considered to be a past or current source of groundwater contamination.

In 1999, a video taken inside of the tank revealed that there were cracks in the top of the tank and damaged tank liner with exposed aggregate. Structural integrity of the tank bottom cannot be determined due to the sludge layer. While the data indicated that the tank has not leaked, the current radiological hold up and the deteriorating tank structural integrity could present a potential future risk to human health and the environment. An interior photo of the 241Z361 Settling Tank taken in 1975 is shown in Figure 7.

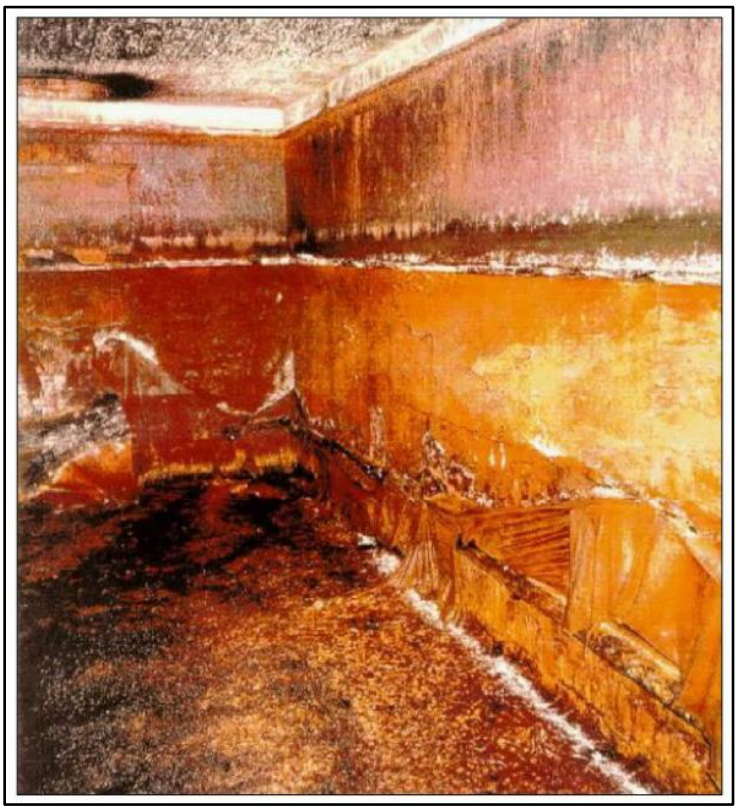

Figure 7. Internal View of the 214Z361 Settling Tank (1975)

2.2 Other Actions to Date

This section describes previous and current actions implemented at the Z Belowgrade Structures.

2.2.1 Previous Actions

A non-operational structure, 216Z9C Z9 Weather Enclosure, contained the mechanical components of the sediment removal equipment. This structure was sealed at the interface of the crib's concrete slab roof and has been removed.

Extensive soil and groundwater investigations and remediation have been conducted in and around the Z Belowgrade Structures. The information is provided in DOE/RL-2015-23, *Remedial Design/Remedial Action Work Plan for the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units* (hereinafter referred to as the 200-PW 1/3/6, 200-CW-5 remedial design [RD]/remedial action work plan [RAWP]).

2.2.2 Current Actions

Surveillance and maintenance activities are being performed in accordance with the current work procedures. A structural analysis report was issued October 23, 2019, which supported a recommendation

to stabilize these structures (CHPRC-1904309, "Contract Number DE-AC06-08RL14788 – Structural Evaluation of Select Aging Structures").

In addition, all of these belowgrade structures are associated with waste sites that are covered under the 200-PW-1 OU. The 200-PW 1/3/6, 200-CW-5 RD/RAWP (DOE/RL-2015-23) has been approved, but this removal action will not preclude performance of the selected remedy. Currently, a portion of this removal action is located within radiologically posted areas associated with the PFP structure removal action, which is ongoing and anticipated to be completed in April 2020. This removal action will coordinate with PFP and sequence work accordingly.

2.3 State and Local Authorities Role

A briefing has been provided to the U.S. Environmental Protection Agency, the lead regulatory agency, and the public of the removal action to interim stabilize the Z Belowgrade Structures. The Washington State Department of Ecology was also informed of the decision.

3 Threats to Human Health or the Environment

The Z Belowgrade Structures were used to dispose of liquid waste discharged from plutonium production at the Hanford Site. The structures are highly contaminated with both radiological and chemical substances. As the structures are part of existing waste sites, the following contaminants of concern in Table 2 were identified for the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 OUs.

Table 2. Contaminants of Concern at the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units

Contaminants of Concern	
Plutonium-239/240	Boron
Americium-241	Carbon tetrachloride
Cesium-137	Methylene chloride
Radium-226	Mercury
Strontium-90	Polychlorinated biphenyls

Source: Table 2-1 in DOE/RL-2015-23, *Remedial Design/Remedial Action Work Plan for the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*.

In addition to serving as a TCRA memorandum, this document also serves as a Removal Site Evaluation in accordance with 40 CFR 300.410, "Removal Site Evaluation."

4 Endangerment Determination

Security controls, including administrative and physical access controls, are currently in place to limit unauthorized entry to the Hanford Site. Only authorized and trained personnel are allowed entrance into areas with existing hazards. As long as DOE retains control of these areas, existing institutional controls will prevent direct contact with and exposure to hazardous substances. However, institutional controls would not prevent deterioration of the buildings/structures and potential release of contaminants to the environment. Contaminants could be released directly to the environment through a fire; breach in a utility pipe, containment wall, or roof; or building collapse as the buildings/structures age and deteriorate. Contaminants could also be released to the environment indirectly through animal and human intrusions.

As the Z Belowgrade Structures continue to age and degrade without active intervention, the likelihood of release of and subsequent exposure to hazardous substances increases. In some cases, removal of buildings/structures will accommodate access for remediation of identified waste sites. The potential exposure to human health and the environment, the potential threat of future releases, and the substantial risks associated with the hazardous substances in the structures addressed by this AM justify use of removal action authority in accordance with the NCP (40 CFR 300.415, "Removal Action").

5 Proposed Action and Estimated Cost

The proposed removal action and estimated cost to support the interim stabilization of the Z Belowgrade Structures are discussed below.

5.1 Selected Removal Action

The selected removal action is interim stabilization of the Z Belowgrade Structures using engineered grout. Stabilization will mitigate the potential subsidence at the Z Belowgrade Structures that could result in releasing hazardous substances into the environment. This proposed action will not preclude the final remedial action.

5.2 Contribution to Remedial Performance

The removal action was developed in consideration of the 200-PW 1/3/6, 200-CW-5 ROD (EPA et al., 2011). The selected removal action will not preclude the final disposition described in the 200-PW 1/3/6, 200-CW-5 RD/RAWP (DOE/RL-2015-23). DOE-RL does not intend or expect this stabilization to impact the overall completion of 200-PW-1/3/6, 200-CW-5 scope.

5.3 Alternatives Evaluated

DOE considered protective alternatives spanning from controlled collapse to erection of aboveground structures. The starting point for alternatives identification was Expert Panel, 2017, "Hanford PUREX Tunnel 2 Expert Panel Report," performed for stabilization of PUREX Tunnel 2. Additional options were considered for insertion into the void spaces but dismissed due to chemical compatibility issues.

5.4 Compliance with Applicable or Relevant and Appropriate Requirements

Pursuant to 40 CFR 300.415(j), removal actions shall attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable considering the urgency of the situation. Practicability is based upon the urgency of the situation and scope of the removal. A requirement under other environmental laws may be either applicable or relevant and appropriate but not both. Identification of ARARs must be done on a site-specific basis and involves a two-part analysis: first, a determination whether a given requirement is applicable; then, if it is not applicable, a determination whether it is nevertheless both relevant and appropriate.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law. While not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, the requirements address problems or situations sufficiently similar to those encountered at the CERCLA site, so their use is well suited to the particular site.

As specified in this AM, the interim stabilization of the Z Belowgrade Structures will be performed in according with the identified ARARs in Table 3.

Table 3. Identification of Applicable and Relevant or Appropriate Requirements

ARAR Citation	ARAR	Requirement	Rationale for Use
"Dangerous Waste Regulations" (WAC 173-303)			
WAC 173-303-016, "Identifying Solid Waste"	ARAR	Identifies those materials that are and are not solid waste.	Substantive requirements of these regulations are applicable because they define how to determine which materials are subject to the designation regulations. Specifically, materials that are generated for removal from the CERCLA site during the removal action would be subject to the substantive provisions for identifying solid waste to ensure proper management.
WAC 173-303-017, "Recycling Processes Involving Solid Waste"	ARAR	Identifies materials that are and are not solid waste when recycled.	Substantive requirements of these regulations are applicable because they define how to determine which materials are subject to the designation regulations. Specifically, materials generated for removal from the CERCLA site during the removal action would be subject to the substantive provisions for identifying solid waste to ensure proper management.
WAC 173-303-070(3), "Designation of Dangerous Waste"	ARAR	Establishes the method for determining whether a solid waste is or is not a dangerous waste or an extremely hazardous waste.	Substantive requirements of these regulations are applicable to materials encountered during the removal action. Specifically, solid waste generated for removal from the CERCLA site during this removal action would be subject to the dangerous waste designation substantive provisions to ensure proper management.
WAC 173-303-140(4), "Land Disposal Restrictions"	ARAR	This regulation establishes state standards for land disposal of dangerous waste and incorporates, by reference, the federal requirements of 40 CFR 268, "Land Disposal Restrictions," that are applicable to solid waste designated as dangerous or mixed waste in accordance with WAC 173-303-070(3).	Substantive requirements of this regulation are applicable to materials that may be encountered during the removal action.
WAC 173-303-170, "Requirements for Generators of Dangerous Waste"	ARAR	Establishes the requirements for dangerous waste generators.	Substantive requirements of these regulations are applicable to materials encountered during the remedial action. Specifically, the substantive standards for management of dangerous/mixed waste are applicable to the interim management of certain waste that will be generated during the remedial action. For purposes of this remedial action, WAC 173-303-170(3) includes the substantive provisions of WAC 173-303-200, "Conditions for Exemption for a Large Quantity Generator that Accumulates Dangerous Waste," by reference.

Table 3. Identification of Applicable and Relevant or Appropriate Requirements

ARAR Citation	ARAR	Requirement	Rationale for Use
"Radiation Protection—Air Emissions" (WAC 246-247)			
WAC 246-247-035(1)(a)(ii), "National Standards Adopted by Reference for Sources of Radionuclide Emissions"	ARAR	Establishes requirements equivalent to Subpart H in 40 CFR 61. Radionuclide airborne emissions from the facility shall be controlled so as not to exceed amounts that would cause an exposure to any member of the public of greater than 10 mrem/yr effective dose equivalent.	Substantive requirements of this standard are applicable because a remedial action may include activities such as stabilization of contaminated areas and equipment and operation of exhausters and vacuums, each of which may provide airborne emissions of radioactive particulates to unrestricted areas. As a result, substantive requirements limiting emissions apply. This activity is a risk-based standard for the purposes of protecting human health and the environment. These requirements are action specific.
WAC 246-247-040(1), (3), and (4); "General Standards"	ARAR	Emissions shall be controlled to ensure that emission standards are not exceeded. Actions creating new sources or significantly modified sources shall apply best available controls. All other actions shall apply reasonably achievable controls.	Substantive requirements of this standard are applicable because fugitive, diffuse, and point source emissions of radionuclides to ambient air may result from removal activities such as the operation of exhauster and vacuums performed during the remedial action. The 10 mrem/yr effective dose equivalent standard to the maximally exposed individual will be met through holistic compliance with WAC 246-247. Reasonable effort will be made to maintain radioactive material to unrestricted areas. This standard exists to ensure compliance with emission standards. These requirements are action specific.
WAC 246-247-075(8), "Monitoring, Testing, and Quality Assurance"	ARAR	Facility (site) emissions resulting from nonpoint and fugitive sources of airborne radioactive material shall be measured. Measurement techniques may include ambient air measurements, or inline radiation detector or withdrawal of representative samples from the effluent stream, or other methods as determined by the lead agency. Accidental scenarios with a probability of greater than one percent chance will be addressed.	Substantive requirements are applicable when fugitive and diffuse emissions of airborne radioactive material due to stabilization and related activities occur and will require measurement. This requirement is action specific. It was determined that these cribs need to be stabilized due to the age and status of these cribs. As a result, addressing an accident scenario will be documented within the Air Monitoring Plan (Appendix C).
"General Regulations for Air Pollution Sources" (WAC 173-400)			
WAC 173-400-035(3), "Nonroad Engines"	ARAR	Nonroad engine requirements, as compared to stationary permitted engines, have a state-specific set of conditions from which they need to comply to. As a nonroad engine specific fuel standards are substantive and applicable. All engines must use ultra low sulfur diesel fuel with a sulfur content of 15 ppm or 0.0015% sulfur by weight or less.	The substantive diesel fuel specification is applicable for all nonroad engines. All diesel fuel used at the Hanford Site is low sulfur fuel. As a result, substantive standards established for the control and prevention of air pollution may be relevant and appropriate.

Table 3. Identification of Applicable and Relevant or Appropriate Requirements

ARAR Citation	ARAR	Requirement	Rationale for Use
WAC 173-400-040, "General Standards for Maximum Emissions"	ARAR	Methods of control shall be employed to minimize the release of air contaminants associated with fugitive emissions resulting from materials handling, construction, demolition, or other operations. Emissions are to be minimized through application of best available control technology.	Substantive requirements of these standards are relevant and appropriate to this removal action because there may be visible, particulate, fugitive, and hazardous air emissions and odors resulting from stabilization activities. As a result, substantive standards established for the control and prevention of air pollution may be relevant and appropriate.
WAC 173-400-113, "New Sources in Attainment or Unclassifiable Areas—Review for Compliance with Regulations"	ARAR	This regulation applies to new and modified sources and requires controls to minimize the release of associated criteria and toxic air emissions. Emissions are to be minimized through application of best available control technology.	It is unlikely that the substantive provisions in this regulation would be triggered during this TCRA. However, substantive requirements of this regulation would be applicable to removal actions performed at the site if a treatment technology that emits regulated air emissions was necessary during the implementation of the TCRA. This requirement is action specific.
"Controls for New Sources of Toxic Air Pollutants" (WAC 173-460)			
WAC 173-460-040, "New Source Review" WAC 173-460-050, "Requirement to Quantify Emissions" WAC 173-460-060, "Control Technology Requirements" WAC 173-460-150, "Table of ASIL, SQER and de Minimis Emission Values"	ARAR	Emissions of toxic air contaminants shall be quantified and ambient impacts evaluated against regulatory limits. Best available control technology for toxics shall be used as determined by the lead agency to protect human health and the environment.	Substantive requirements of these standards are relevant and appropriate to this removal action because there is the potential for toxic air pollutants to become airborne as a result of the work scope. As a result, substantive standards established for the control of toxic air contaminants may be relevant and appropriate as determined by new source review. As a result, substantive standards established for the control and prevention of air pollution may be relevant and appropriate.
"Ambient Air Quality Standards and Emission Limits for Radionuclides" (WAC 173-480)			
WAC 173-480-050(1), "Emission Standards for Maximum Permissible Emissions"	ARAR	This regulation establishes general standards for all radionuclide emission units and requires emission units to meet WAC 246-247 requiring every reasonable effort to maintain radioactive materials in effluents to unrestricted areas ALARA. The regulation indicates that control equipment of sites operating under ALARA shall be defined as reasonably achievable control technology and ALARA control technology.	The potential for fugitive and diffuse emissions due to stabilization and related activities potentially will require efforts to minimize those emissions by meeting substantive provisions of WAC 246-247. This requirement is action specific.
WAC 173-480-060(2), "Emission Standards for New and Modified Emission Units"	ARAR	Requires that construction, installation, or establishment of a new air emission unit shall use best available radionuclide control technology.	The potential for fugitive and diffuse emissions due to stabilization and related activities potentially will require efforts to minimize those emissions by meeting substantive provisions of WAC 246-247. This requirement is action specific.

Table 3. Identification of Applicable and Relevant or Appropriate Requirements

ARAR Citation	ARAR	Requirement	Rationale for Use
WAC 173-480-070(2), "Emission Monitoring and Compliance Procedures"	ARAR	Requires that procedures specified in WAC 246-247 or approved specifically by the regulatory agency shall be used to determine compliance with the 10 mrem/yr standard for dose to any member of the public. Compliance is determined by calculating the dose to members of the public at the point of maximum annual air concentration in an unrestricted area where any member of the public may be located.	The potential for radionuclide emissions from some TCRAs, such as fugitive and diffuse emissions during grouting, and related activities would be performed in compliance with the public dose standard. This requirement is action specific.

Note: Complete reference citations are provided in Chapter 10.

ALARA = as low as reasonably achievable
ARAR = applicable or relevant and appropriate requirement
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
TCRA = time-critical removal action

5.5 Project Schedule and Cost Estimate

The removal action stabilization for the Z Belowgrade Structures is scheduled to begin in the second quarter of fiscal year 2020 and anticipated to be completed by the second quarter of fiscal year 2021. The summary of cost to implement the removal action is presented in Table 4.

Table 4. Total Cost for the Removal Action at the 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank

Action	Total Cost in Present Worth
Interim Stabilization of 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank	$10,658,200

6 Expected Change in the Situation Should Action Be Delayed or Not Taken

The Z Belowgrade Structures addressed in this TCRA contain significant inventories of hazardous substances. The structures are overstressed and at risk of age-related failure, which could result in a release of contamination with negative impacts to human health and the environment. If near-term interim stabilization actions are not performed in a timely manner, the structures will further deteriorate. A subsidence event at the Z Belowgrade Structures could result in an unacceptable result.

Therefore, the removal action is warranted to alleviate this potential risk. Radiological and chemical contamination in the Z Belowgrade Structures present a sufficient threat of risk to human health and the environment to justify a TCRA.

7 Outstanding Policy Issues

There are no outstanding policy issues associated with this removal action.

8 Enforcement

DOE is conducting this removal action as the lead agency under the authority of Executive Order 12580, affirmed by 40 CFR 300.5, "Definitions," and 40 CFR 300.415(b)(1).

9 Recommendations

This AM presents the selected removal action for the Z Structures. The selected action is interim stabilization of the Z Belowgrade Structures using engineered grout.

This decision document is developed in accordance with CERCLA as amended by SARA, and is consistent with the NCP. Conditions at the Z Belowgrade Structures meet the NCP (40 CFR 300.415(b)) criteria for a removal action. The removal action provides overall protection of human health and the environment, is cost effective, complies with ARARs, and is consistent with and contributes to the efficient performance of Hanford Site long-term remedial actions.

10 References

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Appendix A

Removal Action Stabilization Plan

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Contents

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Terms

ALARA	as low as reasonably achievable
AM	action memorandum
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CRR	cultural resource review
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HASP	Health and Safety Plan
NRC	National Response Center
OU	operable unit
PFP	Plutonium Finishing Plant
PPE	personal protective equipment
QA	quality assurance
RWP	radiological work permit

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A1 Introduction

This Removal Action Stabilization Plan describes the activities that will be performed during the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) time-critical removal action at the 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank (hereinafter collectively referred to as the Z Belowgrade Structures) located in the 200 West Area within the 200-PW-1 Operable Unit (OU). The action memorandum (AM) authorizes interim stabilization of each structure.

A2 Removal Action Activities

The following sections provide general descriptions of the anticipated removal activities.

A2.1 Removal Action Stabilization Activities

The belowgrade structures will be stabilized to prevent subsidence and control migration of contamination. Final remediation will be deferred to a future action that is addressed in DOE/RL-2015-23, *Remedial Design/Remedial Action Work Plan for the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*.

A2.2 Field Activities

The following sections describe the field activities associated with this removal action.

A2.2.1 Investigation Activities

A field investigation will be performed on the Z Belowgrade Structures prior to stabilization activities. The investigation will document the internal conditions of each structure and provide information for work planning purposes. Information will support any necessary surface modifications; installation of monitoring, ventilation, and filtration equipment; installation of a grout conveyance system; filling the belowgrade structures with grout; and discharging grout, rinsate, and water. The following activities will be performed during the investigation:

- Industrial hygiene surveys, radiological surveys, and dose rate readings
- Riser inspection
- Structure void inspection
- 360 degree video recording of risers and structure voids

Following the investigation and prior to field work initiation, a mock-up of the grout conveyance system will be conducted.

A2.2.2 Mobilization and Site Preparation

After the field investigation and mock-up have been completed, mobilization and site preparation activities will begin. Mobilization and site preparation may include the following activities:

- Establish site utility services (e.g., temporary power, lighting, and water).
- Construct roads, field support facilities, and waste management areas. Hanford Site roadways will be constructed using existing site materials, except the surface course, which may be imported.
- Isolate or verify isolation of utilities and systems, if necessary.

- Identify underground injection control wells in the proximity of the work area, and notify the Hanford Site single point of contact.

The 217Z Maintenance Area or an alternate nearby location will be used as a staging area for grout delivery, pumping operations, and field monitoring. The Z Belowgrade Structures are located within radiologically posted areas (Figure A-1); therefore, many field activities will be conducted from the staging area.

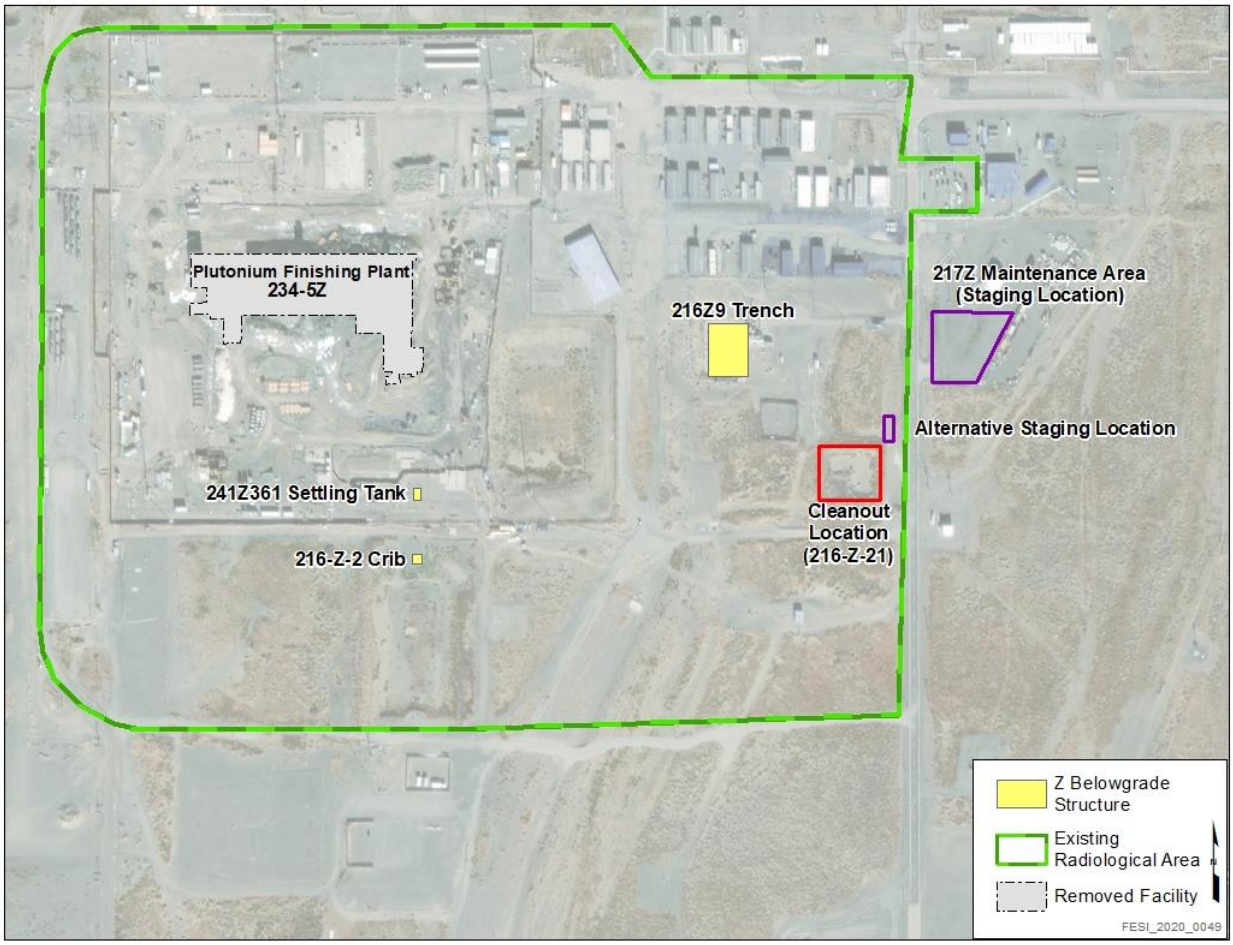

Figure A-1. Z Belowgrade Structures Location

A2.2.3 Removal Action Stabilization

The Z Belowgrade Structures will be stabilized with engineered grout. Based on the results of the field investigation, modifications may be made to risers. Monitoring and ventilation equipment will be installed prior to grouting.

Trucks will deliver grout to the staging area. Engineered grout will be pumped to the structures via a conveyance system to minimize the amount of personnel and equipment in the radiologically posted areas. Existing aboveground risers at each structure will be used to facilitate grout pumping operations. The risers will also be used for ventilation, video recording, and lighting to monitor the internal conditions as grout progresses for the 216Z9 Trench and 241Z361 Settling Tank. Flushing water will be used to clean the conveyance system after each shift or more frequently, if needed (e.g., unplanned stoppage). Unused grout and flushing water will be discharged to the ground near each structure and/or

pumping station (e.g., the 216-Z-21 Seepage Basin) for clearing portions of the grout conveyance system in the work area, as appropriate.

The engineered grout will be manufactured at an offsite location; an onsite batch plant will not be used. Trucks will deliver grout to the staging area. After offloading grout, the truck chutes will be sprayed with water to remove excess grout. The planned cleanout area is shown in Figure A-1; however, the location may change to meet project needs.

The 216-Z-2 Crib will be grouted first, followed by the 241Z361 Settling Tank, and then the 216Z9 Trench.

A2.2.4 Site Stabilization

The following activities will be completed once the Z Belowgrade Structures are stabilized:

- Perform cleanup and site stabilization
- Perform final surveys
- Implement final posting and access control measures

Final cleanup will be conducted as grouting activities are completed. Waste will be screened, segregated, removed, and disposed. Using the data from the final survey, a site access control plan will be developed that will define areas where access must be controlled. These sites will be posted and, if necessary, fences or other barriers will be built to prevent access to the area.

A2.2.5 Demobilization

At the completion of field activities, trailers and equipment used to support this removal action will be demobilized or turned over to another project for reuse. In some cases, equipment may no longer be used due to levels of contamination or disrepair.

A2.2.6 Air Emissions Monitoring

Air emissions and work activity monitoring will be accomplished through a combination of real-time monitoring, sampling and surveys at work locations, near-facility monitors, and the Hanford Site perimeter monitors. Appendix C, “Air Monitoring Plan,” provides additional information about air emissions monitoring.

A2.2.7 Waste Management and Disposal

Several waste streams may be generated from this removal action. It is anticipated that some of the waste will be low-level waste; however, dangerous or mixed waste also could be generated. The majority of the waste will be in a solid form; however, wastewater resulting from liquid discharges will also be present. Waste will be packaged to meet the applicable waste acceptance criteria of the receiving facilities. Appendix B includes the Waste Management Plan for this removal action.

A2.3 Utility Systems

No existing utilities will be used or modified during this removal action. All utilities for the removal action will be portable (i.e., generators, water trucks, etc.) and will be removed after stabilization activities are complete.

A3 Safety and Health Management Controls

This chapter describes the safety and health management and controls performed for the removal activities.

A3.1 Emergency Management

The contractor Emergency Management Program (including preparedness, planning, and response) contains the administrative responsibilities for compliance with DOE/RL-94-02, *Hanford Emergency Management Plan*, and all applicable U.S. Department of Energy (DOE) orders. The Emergency Management Program establishes a coordinated emergency response organization capable of planning for, responding to, and recovering from industrial, security, and hazardous material incidents. Emergency action plans for contractor-managed hazardous facilities identify the capabilities necessary to respond to emergency conditions, provide guidance and instruction for initiating emergency response actions, and serve as a basis for training personnel in emergency actions for each facility.

The emergency response actions within the emergency action plan are provided for recognizing incidents and/or abnormal conditions, initiating protective actions, and making the proper notifications. Emergency response for this project will include required notification to the National Response Center (NRC) for reportable quantity releases and notification for other emergency situations. Notification to the NRC under 40 CFR 302, "Designation, Reportable Quantities, and Notification," applies only to hazardous substances discovered or released that were not evaluated as part of this CERCLA removal action. Hazardous substances that are subject to this removal action are not subject to this reporting requirement because such substances are already subject to CERCLA cleanup authority.

A3.2 Safeguards and Security

Access to the Hanford Site is restricted; therefore, unauthorized access to the Z Belowgrade Structures is prohibited. Access to the removal action area is controlled by the contractor using items such as fences and signs. Access requirements for employees, nonemployees, and/or visitors will be defined in contractor procedures.

A3.3 Safety and Health Program

Personnel at the Plutonium Finishing Plant (PFP) maintain the Health and Safety Plan (HASP) for the area in which the project work scope will occur. The contractor will develop the 10 CFR 851, "Worker Safety and Health Program," required Construction Worker Safety and Health Plan to support stabilization work scope or, as applicable, a generic plan for all construction that will satisfy this requirement. The contractor will also develop and maintain a worksite Job Hazard Analysis in accordance with contractor procedures, when required. All contractor and subcontractor staff and craft that need to access the work area in support of stabilization shall read and sign the PFP HASP and complete appropriate training.

A3.3.1 Radiological Controls and Protection

The radiological controls and protection program is defined in DOE-approved programs and contractor approved internal work requirements and processes. The radiological controls and protection program implements the contractor policy for reducing risks to worker safety or health to as low as reasonably achievable (ALARA) levels and ensuring adequate protection of workers. The radiological protection program of the contractor meets the requirements of 10 CFR 835, "Occupational Radiation Protection." Appropriate dosimetry, personal protective equipment (PPE), ALARA planning, periodic surveys, and health physics technician support will also be provided.

A radiological work permit (RWP) will be prepared as needed for work in areas with potential radiological hazards. The RWP extends the radiological protection program to the specific worksite or operation. All personnel assigned to the project and all worksite visitors must strictly adhere to the provisions identified in the RWP.

Standard contractor controls for work in radiological areas are assessed as adequate to control project activities. Besides identifying the specific conditions, these controls will govern the specific requirements for an activity, periodic radiation and contamination surveys of the work area, and periodic or continuous observation of the work by the radiological controls organization. The ALARA planning process will be used to identify shielding requirements, contamination control requirements, radiation monitoring requirements, and other radiological control requirements for the individual project tasks.

Measures will be taken to minimize impacts to the environment during work activities. Appendix C addresses the controls to be used during project activities to address the potential release of radionuclides to the environment but not to the exclusion of 10 CFR 835 requirements. Radiological worker exposure will be monitored using approved occupational radiological protection methods.

A3.3.2 Criticality Safety

The Z Belowgrade Structures have nonexempt quantities of fissile material. An associated criticality safety evaluation report is required prior to any intrusive activities in the Z Belowgrade Structures. Additional work controls may be imposed to ensure subcriticality.

A4 Project Administration

The following sections describe the management approach for implementing the removal action, including schedule summary information, project team descriptions, training and qualifications, quality assurance (QA), and post-removal activities.

A4.1 Cost Summary

The cost for stabilization of the 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank is estimated at $10,658,200.

A4.2 Schedule

The removal action for the Z Belowgrade Structures is scheduled to begin in the second quarter of fiscal year 2020 and is anticipated to be completed by the second quarter of fiscal year 2021.

A4.3 Project Team

The project team includes the individuals working to accomplish the removal action. Accordingly, the project team includes the lead regulatory agency (U.S. Environmental Protection Agency [EPA]), lead agency (DOE), U.S. Department of Energy, Richland Operations Office Removal Action Manager, contractor removal action organization, site project organization, QA organization, radiological control organization, health and safety organization, environmental compliance officer, waste management lead, and other contractor and subcontractor staff.

A4.4 Change Management

If a fundamental change to the selected removal action that is not within the scope of work is identified, the AM will be modified, or an addendum to the AM will be prepared to allow DOE to consider an amended removal action.

Established configuration/change control processes ensure that proposed changes are reviewed in relation to the specified commitments. If a breach of these commitments is discovered, work will cease so that recovery actions may be identified and implemented. Change management will comply with appropriate contractor procedures.

Determining the significance of the change is the responsibility of DOE. Contractor management is responsible for tracking changes and obtaining appropriate reviews by contractor staff. Contractor management will discuss the change with DOE, and DOE will then discuss the type of change that is necessary with EPA. Appropriate documentation will follow.

A4.5 Personnel Training and Qualifications

Staff experience and capabilities are important in maintaining worker and environmental safety. Knowledge of ongoing operations, understanding of conditions encountered, and lessons learned will ensure continued safe operations.

Training requirements will ensure that personnel are able to work safely in and around radiological areas and maintain ALARA radiation exposures. Safety courses, training materials, site-specific information, and available technologies will be presented to provide adequate training for workers. Records of required training will be maintained in readily accessible personnel files.

Health physics workers are required to be current in health physics technician qualification training, which includes passing examinations to demonstrate an understanding of theoretical and applied classroom materials.

Specialized training will be provided as needed to instruct workers in the use of nonstandard equipment, performance of abnormal operations, and hazards of specific activities. Specialized training could be provided through on-the-job activities, classroom instruction and testing, or pre-job briefings. The depth of training in any discipline will be commensurate with the degree of the hazards involved and the knowledge required for task performance. Some activities will require using expert services as opposed to project staff training.

The contractor training program will provide workers with the knowledge and skills necessary to execute assigned duties safely. A graded approach will be used to ensure that workers receive a level of training commensurate with their responsibility that complies with applicable requirements. Specialized employee training will include pre-job safety briefings, plan-of-the-day meetings, and facility or worksite orientations. Training and qualifications will be determined as required by job assignment for specific work activities.

The RWP and activity hazards analysis will include specific requirements for project activities, which will include PPE and required training for project personnel.

A4.6 Quality Assurance Program

QA activities will use a graded approach based on potential environmental, safety, health, reliability, and continuity of operation impacts. Other specific activities will include QA implementation, responsibilities and authority, document control, QA records, and audits.

A4.7 Post-Removal Action Activities

Removal activities completed as part of this removal action will be documented on a Facility Status Change Form as required by DOE O 430.1C, *Real Property Asset Management*. The form will provide a

summary of the actions taken, the "as-left" condition of the area, and an assessment of the underlying soil as applicable. DOE will approve the form to document completion of the removal action. This form will support the future remedial action for the 200-PW-1 OU and the eventual disposition of the entire 200 West Area of the Hanford Site.

A5 Reporting Requirements for Non-Routine Releases

The following reporting requirements apply for hazardous substances that could be released during removal activities.

- 40 CFR 302 requires immediate notification to the NRC on discovery of a release of a hazardous substance into the environment in excess of a reportable quantity.
- 40 CFR 355, "Emergency Planning and Notification," requires immediate notification to the community emergency coordinator for the local emergency planning committee and to the State Emergency Response Commission for a release of a reportable quantity of an extremely hazardous substance, a comprehensive release of a reportable quantity of an extremely hazardous substance, or a CERCLA hazardous substance.
- Emergency response for this project will include required notification to the NRC for reportable quantity releases and Removal Action Manager notification for other emergency situations.

A6 Cultural/Ecological Resources

Cultural and ecological resource reviews will be performed as appropriate before starting removal activities. These reviews will be conducted in accordance with DOE requirements. If potential impacts are identified, mitigation action plans will be developed and implemented. Scenarios described in the following subsections provide further detail for these reviews.

A6.1 Cultural

Cultural resource reviews (CRRs) will follow the substantive requirements of Section 106 of the *National Historic Preservation Act of 1966*, which has been superseded by Section 306108 of the *National Preservation Programs, Division A—Historic Preservation*. The removal activities would be performed in areas that have been extensively disturbed by past construction activities, and most buildings/structures have been evaluated for their National Register of Historic Places eligibility as part of DOE/RL-97-56, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*. Some buildings and structures are contributing properties to the Manhattan Project or Cold War Era Historic District, and they require mitigation through documentation (e.g., completed inventory forms). Before field activity begins, buildings and structures requiring documentation are evaluated for the following information:

- Type of documentation required for each building or structure (Historic Property Inventory Form or Expanded Historic Property Inventory Form)
- Status of the documentation

CRR documentation requirements for any affected structure will be identified and completed before the removal action begins. Impacts on cultural resources in the vicinity of the removal action will be mitigated in accordance with DOE/RL-98-10, *Hanford Cultural Resources Management Plan*.

A6.2 Ecological

Ecological reviews will be completed before work begins in areas where there is potential for adverse effects to sensitive or rare biological resources consistent with existing routine procedures (DOE/RL-95-11, *Ecological Compliance Assessment Management Plan*). Because the structures could support ecological resources (e.g., nesting birds or bat roosts), surveys must be conducted prior to stabilization. Project engineers will consult with the ecological compliance staff in advance of planned activities to allow for sufficient ecological surveys.

If any nesting birds (if not a nest, a pair of birds of the same species or a single bird that will not leave the area when disturbed) are encountered or suspected, removal activities shall be evaluated before work is continued. Prior to stabilization activities, a facility walkdown and survey will be performed during daylight hours to document any evidence that could indicate high numbers of bats that could suggest possible roosting site(s). In the event such evidence is discovered, DOE will be consulted for further recommendations.

No plants or animals listed as threatened, endangered, or candidate species under the federal *Endangered Species Act of 1973* are known to be affected by structure stabilization activities. Very little native or natural habitat is present in the vicinity of the Z Belowgrade Structures. However, care will be taken to avoid or minimize damage to vegetation, especially shrubs or trees in the vicinity of the structures.

Workers will avoid wildlife that may be found in and around the structures. Appropriate ecological surveys of debris cleanup sites also will be conducted before field activities begin. Procedures to avoid or mitigate damage to sensitive areas identified during ecological reviews will be established before work begins.

Impacts on ecological resources near the removal action will continue to be mitigated in accordance with DOE/RL-96-32, *Hanford Site Biological Resources Management Plan*.

A7 References

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National Historic Preservation Act of 1966, Pub. L. 89-665 as amended, 16 USC 470 et seq. Available at: https://www.govinfo.gov/content/pkg/USCODE-2018-title16/pdf/USCODE-2018-title16-chap1A-subchapII-sec470.pdf.

National Preservation Programs, Division A—Historic Preservation, as amended, Pub. L. 113-287 as amended, 54 USC 300101 et seq. Available at: https://www.govinfo.gov/content/pkg/USCODE-2015-title54/html/USCODE-2015-title54.htm.

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Appendix B

Waste Management Plan

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Contents

Figure

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Terms

ARAR	applicable or relevant and appropriate requirement
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
NCP	National Contingency Plan
RCRA	*Resource Conservation and Recovery Act of 1976*

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B1 Introduction

This waste management plan establishes requirements for the management and disposal of waste generated from stabilization of the 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank (hereinafter collectively referred to as the Z Belowgrade Structures). Implementation of this removal action will be performed in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) and the applicable or relevant and appropriate requirements (ARARs) specified in Section 5.4 of this document.

As authorized by the action memorandum (main section of this document), interim stabilization by grouting will be implemented for each structure. As a result, several waste streams will be generated under this removal action. It is anticipated that the waste will be low-level; however, some dangerous or mixed waste also could be generated. The majority of the waste will be in a solid form, but wastewater resulting from liquid discharges will also be present. The following are laws and regulations from which the ARARs were developed:

- The *Atomic Energy Act of 1954* for U.S. Department of Energy (DOE) management of radioactive waste.
- As implemented by 40 CFR 260, "Hazardous Waste Management System: General," through 40 CFR 268, "Land Disposal Restrictions," and WAC 173-303, "Dangerous Waste Regulations," the *Resource, Conservation and Recovery Act of 1976* (RCRA) for the management of dangerous waste. The identification, storage, treatment, and disposal of hazardous waste and the hazardous component of mixed waste are governed by RCRA. The State of Washington, which implements RCRA requirements under WAC 173-303, has been authorized by the U.S. Environmental Protection Agency (EPA) to implement most elements of the RCRA program. The standards for the generation and storage of dangerous waste will apply to the management of any dangerous or mixed waste generated during the interim stabilization activities. Treatment standards for dangerous or mixed waste subject to RCRA land disposal restrictions are specified in WAC 173-303-140, "Land Disposal Restrictions," which incorporates 40 CFR 268 by reference.

Wastes generated through implementation of this removal action will be disposed at appropriate EPA-approved facilities in accordance with the waste acceptance criteria of those facilities. The Environmental Restoration Disposal Facility (ERDF) is the preferred waste disposal facility for waste meeting ERDF waste acceptance criteria (ERDF-00011, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*). Alternate onsite and/or offsite waste treatment or disposal facilities that meet 40 CFR 300.440, "National Oil and Hazardous Substances Pollution Contingency Plan" (hereinafter referred to as the National Contingency Plan [NCP]), "Procedures for Planning and Implementing Off-Site Response Actions," criteria may be considered if determined to be appropriate and suitable.

Waste management activities addressed in the work packages may include waste characterization, designation, staging, packaging, handling, marking, labeling, segregation, storage, transportation, and disposal. These activities are briefly described in the following chapters.

B2 Projected Waste Streams

One or all of the following solid waste streams are anticipated to be generated during the removal action and may fall into any combination of categories (nondangerous/nonradioactive, radioactive, mixed, hazardous, dangerous, suspect radioactive, suspect dangerous, and suspect mixed):

- Hazardous/dangerous waste, low-level waste, and mixed low-level waste
- Miscellaneous solid waste (e.g., construction debris, personal protective equipment, cloth, plastic, wipes, wood, equipment, tools, pumps, wire, metal casing, plastic piping, and sample returns)
- Equipment and construction materials
- Soils
- Grout and rinsate discharged from grouting operations

B3 Waste Management and Characterization

Waste collected for disposal will be managed in a protective manner to prevent releases to the environment and unnecessary exposure to personnel. Waste-specific storage and packaging requirements will comply with the substantive requirements of WAC 173-303, as specified in the ARARs. Miscellaneous solid waste will be managed as appropriate for the nonradiological and radiological contaminants present or suspected to be present.

Waste generated through implementation of this removal action will be characterized in accordance with the contractor's procedures and the waste acceptance criteria of the receiving facility. Characterization is performed using a variety of information that includes but is not limited to process knowledge, historical analytical data, and radiological and chemical screening.

The stabilization activities will include the conveyance and injection of several thousand yards of concrete to facilitate structural stabilization for the Z Belowgrade Structures. The transfer and injection work activities will necessitate discharging of some grout to the ground in the immediate areas around the structures and pumping station (e.g., 216-Z-21 Seepage Basin) for clearing of portions of the grout conveyance system in the work area, as appropriate (Figure B-1). Some or all of this grout may be left in place for subsequent removal and disposal during future remediation activities in the area.

B3.1 Hazardous/Dangerous Waste, Low-Level Waste, and Mixed Waste

These wastes will be packaged, stored, and transported to prevent dispersion and public exposures. Waste-specific storage and packaging requirements will be described in the contractor's work documents, as appropriate. Dangerous and mixed wastes will be managed in accordance with substantive requirements of WAC 173-303, as specified in the ARARs.

B3.2 Solid Waste

Miscellaneous solid waste will be managed as appropriate for the nonradiological and radiological contaminants present or suspected to be present, if any. Field screening will be used to segregate radioactive waste from nonradioactive waste. Containers will be properly marked and labeled. The containers will be segregated as appropriate and then stored within the designated waste container storage area or within the area of contamination. Miscellaneous solid waste will be dispositioned based on waste characterization information.

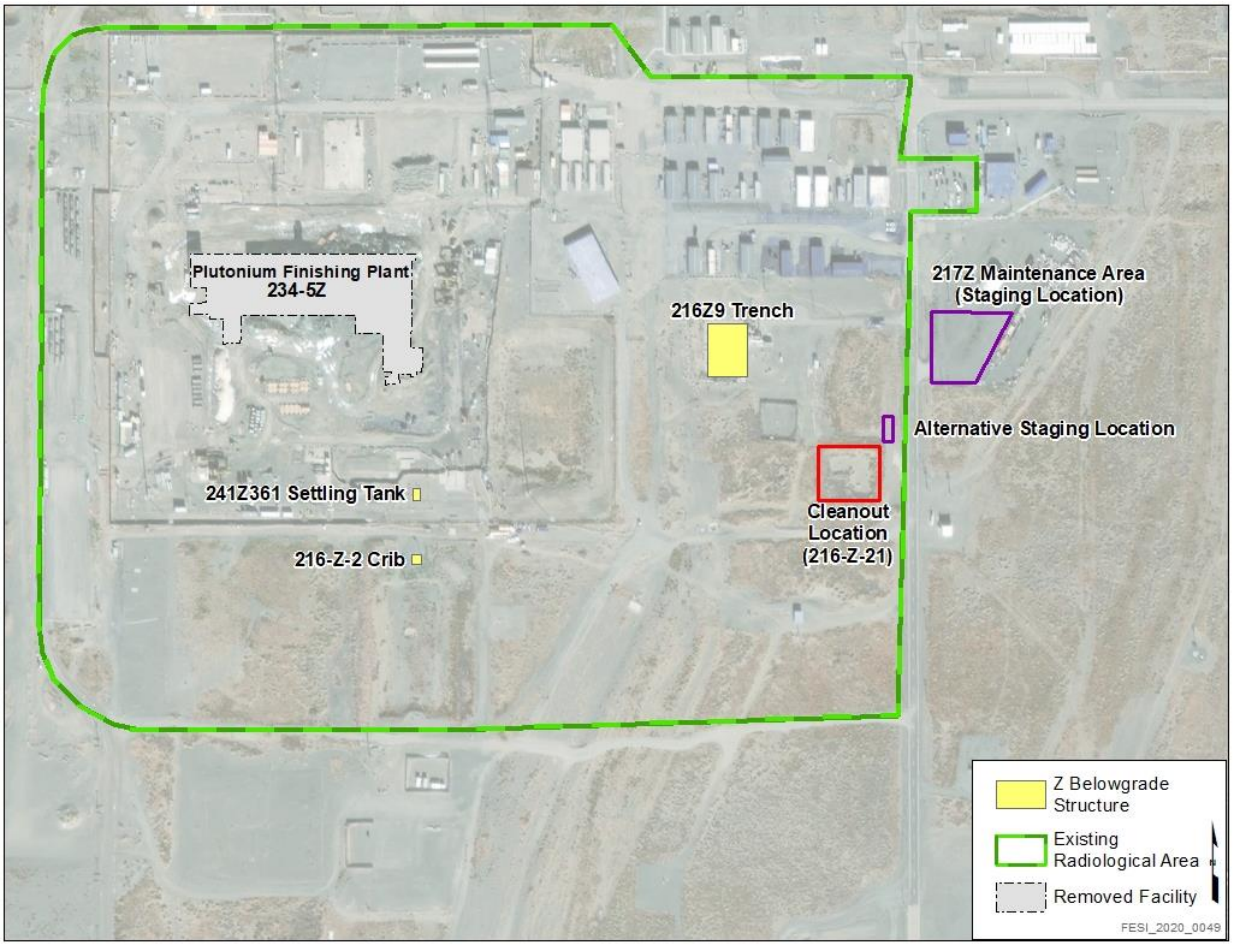

Figure B-1. Z Belowgrade Structures Location

B3.3 Management of Waste Containers

Prior to disposal, dangerous waste containers will be managed in accordance with the substantive provisions of WAC 173-303-200, "Conditions for Exemption for a Large Quantity Generator that Accumulates Dangerous Waste," as specified in the ARARs. Waste containers, including the ERDF roll-on/roll-off containers, are inspected before use to ensure container integrity. The containers will be stored inside the applicable site-specific waste container storage area or area of contamination. Weekly inspections of the containers will be performed to document the integrity; container marking or labeling; physical container placement; storage area boundaries, identification, or warning signs; and sign of any potential leakage. Containers showing signs of deterioration will be identified on the container inspection form and will be over packed or repackaged, as necessary.

B4 Waste Handling, Storage, and Packaging

Marking, labeling, segregation, and staging of waste containers will be performed or directed by the waste specialist. Waste containers will be sent directly to the disposal site. If waste containers need to be temporarily stored pending final disposal, they will be stored at an EPA-approved facility. Dangerous or mixed wastes may also be accumulated in accordance with the substantive generator standards of WAC 173-303-200.

Applicable packaging and transportation requirements for dangerous or mixed waste generated by the removal action will be identified and implemented before the movement of waste. Before being removed from the area of contamination or site-specific waste management area, containers and haul trucks released from radiologically controlled areas will meet exterior contamination limits. Other waste-specific handling and packaging standards may be applicable and will be described in the contractor's work documents, as appropriate.

B4.1 Waste Profile

Waste profiling to establish values for the waste tracking form may take place concurrently with removal action activities. Field screening measurements may be used to obtain data to adjust the waste tracking form, as necessary.

B4.2 Final Waste Disposal

Dangerous, mixed, and radioactive wastes generated through the removal action will be disposed at ERDF, which is the preferred disposal location for waste meeting the facility waste acceptance criteria (ERDF-00011) because it is engineered to meet appropriate RCRA technological requirements for landfills as described in EPA et al., 1995, *Record of Decision: U.S. DOE Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*. If any waste does not meet ERDF waste acceptance criteria, it would be transferred to an offsite disposal facility that has been deemed suitable by the EPA regional office in accordance with the Off-Site Rule at 40 CFR 300.400, "General."

B4.3 Waste Disposal Records

Original Onsite Waste Tracking Forms will be sent to ERDF with each container shipped. Original sample reports and a copy of the Original Onsite Waste Tracking Form for each ERDF container will be retained and forwarded to the assigned waste specialist for inclusion in the project file following final waste disposition.

B5 Waste Treatment

Treatment of certain waste streams during stabilization activities may be necessary to provide safe transport, meet waste disposal facility waste acceptance criteria, and/or to address land disposal restrictions. When necessary, treatment may be conducted at the generating site, ERDF, or at an EPA-approved offsite facility (e.g., Effluent Treatment Facility). Offsite treatment must be performed at an EPA-approved facility in accordance with 40 CFR 300.440. Return of treated waste from offsite treatment facilities for disposal at the ERDF requires authorization from DOE.

B6 Waste Minimization and Recycling

Waste minimization practices will be followed to the extent technically and economically feasible during waste management. Introduction of clean materials into a contamination area as well as contamination of clean materials will be minimized to the extent practicable. Emphasis will be placed on source reduction to eliminate or minimize the volume of waste generated.

Materials released offsite for disposal or recycle must be certified free of contamination in accordance with DOE guidance for non-real property. Waste materials meeting this criterion are not considered CERCLA waste and therefore are not subject to the 40 CFR 300.440 offsite acceptability determination.

B7 Liquid Effluents Management

Liquid effluents will be generated during the removal action activities. Wastewater resulting from washing concrete trucks, pumps, forms, and associated equipment is not subject to permitting under the State Waste Discharge Permit Program and is exempt from Permit ST0004511 per Permit Condition G12.F. Also, discharges to the ground from cleanup activities conducted under CERCLA are acknowledged as being exempt per Condition G12.J. Water and rinsate from grouting operations will be discharged to the ground in the immediate areas around the structures and pumping station (e.g., 216-Z-21 Seepage Basin) as necessary to support clearing of portions of the grout conveyance system (Figure B-1).

B8 References

40 CFR 260, "Hazardous Waste Management System: General," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol28/pdf/CFR-2019-title40-vol28-part260.pdf.

40 CFR 261, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol28/pdf/CFR-2019-title40-vol28-part261.pdf.

40 CFR 262, "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol28/pdf/CFR-2019-title40-vol28-part262.pdf.

40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol28/pdf/CFR-2019-title40-vol28-part263.pdf.

40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol28/pdf/CFR-2019-title40-vol28-part264.pdf.

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol28/pdf/CFR-2019-title40-vol28-part265.pdf.

40 CFR 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol29/pdf/CFR-2019-title40-vol29-part266.pdf.

40 CFR 267, "Standards for Owners and Operators of Hazardous Waste Facilities Operating Under a Standardized Permit," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol29/pdf/CFR-2019-title40-vol29-part267.pdf.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol29/pdf/CFR-2019-title40-vol29-part268.pdf.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*. Available at: https://www.govinfo.gov/content/pkg/CFR-2019-title40-vol30/pdf/CFR-2019-title40-vol30-part300.pdf.

300.400, "General."

300.440, "Procedures for Planning and Implementing Off-Site Response Actions."

58 FR 49200, "40 CFR Part 300: Amendment to the National Oil and Hazardous Substances Pollution Contingency Plan; Procedures for Planning and Implementing Off-Site Response Actions," *Federal Register*, Vol. 58, No. 182, pp. 49200–49218, September 22, 1993. Available at: https://www.govinfo.gov/content/pkg/FR-1993-09-22/pdf/FR-1993-09-22.pdf#page=34.

Atomic Energy Act of 1954, Pub. L. 83-703 as amended, 42 USC 2011 et seq., 68 Stat. 919. Available at: https://www.govinfo.gov/content/pkg/STATUTE-68/pdf/STATUTE-68-Pg919.pdf#page=30.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, Pub. L. 107-377 as amended, 42 USC 9601 et seq., December 31, 2002. Available at: https://www.csu.edu/cerc/researchreports/documents/CERCLASummary1980.pdf.

EPA, DOE, and Ecology, 1995, *Record of Decision: U.S. DOE Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, U.S. Department of Energy, and Washington State Department of Ecology, Seattle, Washington. Available at: https://pdw.hanford.gov/document/D196041064.

ERDF-00011, 2018, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Rev. 1, CH2M HILL Plateau Remediation Company, Richland, Washington. Available at: https://pdw.hanford.gov/document/AR-01205.

Resource Conservation and Recovery Act of 1976, Pub. L. 94-580, 42 USC 6901 et seq. Available at: https://www.govinfo.gov/content/pkg/STATUTE-90/pdf/STATUTE-90-Pg2795.pdf.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Available at: https://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

173-303-140, "Land Disposal Restrictions."

173-303-200, "Conditions for Exemption for a Large Quantity Generator that Accumulates Dangerous Waste."

Appendix C

Air Monitoring Plan

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Contents

Figure

Table

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Terms

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air (filter)
MEI	maximally exposed individual
NESHAP	"National Emission Standards for Hazardous Air Pollutants"
NFM	near-facility monitoring
OU	operable unit
PCM	periodic confirmatory measurement
PTE	potential-to-emit
PTRAEU	portable/temporary radioactive air emissions unit
RD/RAWP	remedial design/remedial action work plan
TEDE	total effective dose equivalent

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C1 Introduction

This air monitoring plan describes the management of air emissions from the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* time-critical removal action at the 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank (hereinafter collectively referred to as the Z Belowgrade Structures) located in the 200 West Area within the 200-PW-1 Operable Unit (OU). The action memorandum authorizes interim stabilization by grouting each structure.

Federal and state applicable or relevant and appropriate requirements (ARARs) for air emissions are identified in Section 5.4 from the main text of this document. Substantive requirements of these standards are applicable to the removal action, as it has the potential-to-emit (PTE) both radionuclides and nonradiological pollutants to the ambient air. Airborne emissions generated from the removal action will be minimized through appropriate work controls in accordance with U.S. Department of Energy (DOE) radiation control and substantive air pollution control standards to maintain Hanford Site air pollutant emissions at as low as reasonably achievable (ALARA) levels. Chapter C2 describes the radiological air emissions associated with the stabilization activities, and Chapter C3 describes the nonradiological air emissions.

The removal activities include field investigation of the structures to confirm internal conditions; surface modifications to allow interim stabilization; installation of monitoring, ventilation, and filtration equipment; installation of a grout conveyance system; filling the belowgrade structures with grout; and the discharge of grout, rinsate, and water. Appendix A, "Removal Action Stabilization Plan," of this document provides additional removal activity details. This removal action will not preclude the planned remedial action (removal, treatment, and disposal) for the Z Belowgrade Structures as documented in DOE/RL-2015-23, *Remedial Design/Remedial Action Work Plan for the 200-CW-5, 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units* (hereinafter referred to as the remedial design [RD]/remedial action work plan [RAWP]).

Stabilization of the Z Belowgrade Structures will be performed using existing aboveground risers. Determining which riser(s) will be used on each structure depends on the results of the field investigation and planning efforts. Grout fill ports, video camera/lighting ports, and instrumentation ports will be installed on other available risers as needed to allow the grout to be placed into the structures' void space in layers or lifts. The filling of the void space in layers is designed to manage the heat generation associated with the curing of the grout, control the displaced air volume through the abatement systems, protect the concrete pillars in the 216Z9 Trench, and stabilize the top layer of the sludge in the 241Z361 Tank to minimize mixing. The 216-Z-2 Crib is planned to be grouted in a single lift due to its relatively small internal volume.

C2 Radiological Air Emissions

The state implementing regulation WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," sets standards that are as or more stringent than the federal implementing regulation 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants" (NESHAP), Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," and the *Clean Air Act Amendments of 1990*. The U.S. Environmental Protection Agency (EPA) partial delegation of the 40 CFR 61 authority to the Washington State Department of Health includes all substantive emissions monitoring, abatement, and reporting aspects of the federal regulation. The federal and state standards require that emissions of radionuclides to the ambient air from the Hanford Site shall not exceed amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr.

The state implementing regulations address control of radioactive airborne emissions where economically and technologically feasible. To address the substantive aspect of these requirements, applicable emission control technologies (those successfully operated in similar applications) will be used when economically and technologically feasible (i.e., based on cost/benefit). Section C2.2 discusses controls that will be used during this removal action. WAC 246-247, "Radioactive Protection—Air Emissions," further addresses radioactive airborne emission sources by requiring monitoring of the sources. Monitoring requires physical measurement of the effluent or ambient air. The substantive provisions of WAC 246-247 that require monitoring radioactive airborne emissions would be applicable to this removal action. Radioactive airborne emissions monitoring is discussed in Section C2.3.

WAC 246-247-075(11), "Monitoring, Testing, and Quality Assurance," requires that the planning for any proposed new construction or significant modification of the emission unit must address accidental releases that have a probability of occurrence during the expected life of the emission unit of greater than 1%. The subsidence of similar structures demonstrates that the probability of occurrence is greater than 1%. Therefore, in the event of any future collapse or accident scenario during stabilization activities, a graded approach will be taken. DOE/RL-94-02, *Hanford Emergency Management Plan*, outlines the Emergency Preparedness Program and framework used by DOE for the notifications and response actions that occur on the Hanford Site. The DOE contractor will use emergency response processes and procedures that align with the DOE document in a similar manner as the response to the Plutonium Uranium Extraction Plant Tunnel 1 subsidence event that occurred in May 2017.

C2.1 Airborne Source Information

The potential exists for point source and diffuse and fugitive radionuclide emissions resulting from stabilization activities at the Z Belowgrade Structures. The identified radionuclides of concern for air emissions during the remedial action, as identified in the RD/RAWP (DOE/RL-2015-23), include the following:

- Americium-241
- Antimony-125
- Carbon-14
- Cerium-139
- Cesium-134/137
- Cobalt-60
- Europium-152/154/155
- Neptunium-237
- Nickel-63
- Plutonium-238/239/240
- Potassium-40
- Radium-226/228
- Strontium-90
- Thorium-228/230/232
- Uranium-233/234/235/238

The annual unabated PTE (activity) and resultant total effective dose equivalent (TEDE) for the onsite maximally exposed individual (MEI) for the remedial action at the Z Belowgrade Structures was calculated in Section 5.1.1.1 of the approved RD/RAWP based on the estimated holdup and the assumption that the remedial action is conducted within one year. The TEDE for the offsite MEI is calculated here using the same methodology in the approved RD/RAWP. The dose-per-unit-release factors from DOE/RL-2006-29, *Calculating Potential-to-Emit Radiological Releases and Doses*, were used to obtain the offsite MEI values. For conservatism, the entire PTE for each structure is multiplied by the highest offsite dose-per-unit-release factor at a release height of under 131 ft which, from the isotopes listed above, is plutonium-239/240. DOE/RL-2006-29 also designates the assigned MEI for the Hanford Site emissions zones. For the Z Belowgrade Structures in the 200 West Area emission zone, the assigned offsite MEI is at the Hanford Site boundary located 13.7 mi to the southeast.

Table C-1 presents the unabated TEDE to the onsite and offsite MEIs. Actual emissions will be less as the remedial action scope encompasses removal, treatment, and disposal of the Z Belowgrade Structures (contents, structures, and underlying soils), while this removal action is limited to grouting of the structures for interim stabilization. The abated MEI estimates in Table C-1 reflect the temporary contamination controls used during stabilization activities (Section C2.2).

Table C-1. Potential Releases and Maximally Exposed Individual Doses

Location	A Activity (Ci/yr)[a]	B Unabated TEDE to Onsite MEI (mrem/yr)[a]	C A×2.16=C Unabated TEDE to Offsite MEI (mrem/yr)[b]	D B×0.01=D Abated TEDE to Offsite MEI (mrem/yr)[c]	E C×0.01=E Abated TEDE to Offsite MEI (mrem/yr)[c]
216-Z-2 Crib	5.97E+00	4.16E+00	1.29E+01	4.16E-02	1.29E-01
216Z9 Trench	1.43E+01	2.22E+01	3.09E+01	2.22E-01	3.09E-01
241Z361 Settling Tank	1.28E+02	8.91E+00	2.76E+02	8.91E-02	2.76E+00
Totals	**1.48E+02**	**3.53E+01**	**3.20E+02**	**3.53E-01**	**3.20E+00**

a. Activity and onsite MEI values from Tables 5-3 and 5-5 in DOE/RL-2015-23, *Remedial Design/Remedial Action Work Plan for the 200-CW-5, 200-PW-1, 200-PW-3, and 200 PW-6 Operable Unit*. Per agreement (AIR 00-1012, "New Onsite MEI"), the onsite MEI is at the Laser Interferometer Gravitational Wave Observatory.

b. The offsite dose factor for 200 West Area for plutonium-239/240 is 2.16E+00 at a release height of <40 m (131 ft) from Table 4.5 of DOE/RL-2006-29, *Calculating Potential-to-Emit Radiological Releases and Doses*. The information conservatively assumes that the entire activity is plutonium-239/240, as it has the largest offsite dose factor.

c. A HEPA filter removal efficiency factor of 99% (1% instead of the 0.05% leak test requirement) is applied as a conservative measure.

HEPA = high-efficiency particulate air
MEI = maximally exposed individual
TEDE = total effective dose equivalent

C2.2 Control Methods

Both point source and diffuse and fugitive emissions may be generated from this removal action. The use of general radiological control standards and methods will be employed to maintain personnel and environmental radiological exposure in accordance with the ALARA principle, after application of best available radionuclide control technology.

C2.2.1 Point Source Controls

The use of high-efficiency particulate air (HEPA) filtration for point source emissions during the stabilization of the Z Belowgrade Structures is considered as meeting best available radionuclide control technology requirements. Both active and passive HEPA ventilation systems will be employed based on the Z Belowgrade Structures in question.

C2.2.1.1 Active Ventilation (216Z9 Trench and 241Z361 Tank)

Historically, visibility of the cameras that are inserted into tank risers during grouting has been of lower quality due to the heat from the chemical reaction of the grout and the humidity of the tank environment. As a result, the stabilization activities at the 216Z9 Trench and 241Z361 Settling Tank will employ the use of portable temporary radioactive air emissions units (PTRAEUs) to pull a slight negative to allow for better visibility, allowing the ability to make sure that the grout is stabilizing the interface with the sludge level at the bottom to minimize mixing.

ASME AG-1-2017, *Code on Nuclear Air and Gas Treatment*, provides minimum requirements for the performance, design, construction, acceptance testing, and quality assurance for HEPA filters used in nuclear safety-related air or gas treatment systems in nuclear facilities. PTRAEUs addressed within this document are not nuclear safety-related equipment and not specifically addressed in ASME AG-1-2017. HEPA filters will have a manufacturer rated removal efficiency of at or above 99.97%. The HEPA filters are in-place leak tested annually using an aerosol to the standard of at or above 99.95%. The filters are not used if aerosol testing performance criteria are not met. The HEPA filters are leak tested in accordance with a written procedure that addresses testing and visual inspections to meet the intent of ASME N511-2017, *In-Service Testing of Nuclear Air-Treatment, Heating, Ventilating, and Air-Conditioning Systems*. ASME N509, *Nuclear Power Plant Air-Cleaning Units and Components*, and ASME N510-2007, *Testing of Nuclear Air Treatment Systems*, are not applicable because they were superseded by ASME N511-2017, as identified above.

Due to the nature of the activities involving use of the PTRAEUs, measurable abated releases associated with these devices are not anticipated, and the near-facility monitoring (NFM) stations described in Section C2.3.1.1 will be used to provide validation of the effectiveness of the contamination control measures for the activities associated with these sources. The stations within Section C2.3.1.1 do not provide real-time data, so their bi-weekly data will be used as indicators, along with the worksite monitoring data for overall trending of the effectiveness of the contamination control measures.

C2.2.1.2 Passive Ventilation (216-Z-2 Crib)

A skid-mounted passive (non-powered) HEPA filter will be temporarily attached to the only available riser on the 216-Z-2 Crib for abatement of displaced air during stabilization activities. A Y-shaped fitting will allow for a single connection point that will couple onto the riser. The other end of the fitting will split into a double-ended opening, allowing for introduction of the grout from the pumping device into the crib through one of the openings with connection of the ventilation tubing at the other opening for air displacement.

The American Society of Mechanical Engineers codes provided are applicable to forced ventilation systems and HEPA filters. The crib is passively ventilated. The Appendix A 40 CFR 61 standards govern the testing of forced ventilation systems not applicable to a passively ventilated system. The ASME AG-1-2017 code sections for ventilation design and sampling systems is designed for forced ventilation systems and are not directly applicable to passively ventilated systems. The HEPA filter system is designed to meet the ASME AG-1-2017 and ASME N509 standards.

The ANSI/HPS N13.1, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*, standards allow for a graded approach for effluent monitoring systems and focus on forced ventilation systems. The passive ventilation system of the crib does not allow for timely extractive sampling of the effluent due to the low effluent flow volumes. WAC 246-247-075 requires that the quality assurance program be compatible with ASME NQA-1-2017, *Quality Assurance Requirements for Nuclear Facility Applications*. Quality assurance for the historical tracking and trending of the NFM sample collection and analyses will be implemented in accordance with the NESHAP Method 114 requirements. Due to the passive nature of the HEPA filters, in-place leak testing cannot be performed.

Because the temporary HEPA filter is passive, it cannot be in-place leak tested in accordance with the air cleaning requirements in ASME AG-1-2017. All radiological grade HEPA filters are tested to 99.97% efficiency, and radiological smears will be taken on the outside of the HEPA filters to verify the control of contamination (Section C2.3.1.2).

C2.2.2 Diffuse and Fugitive Controls

Based on analysis of the potential emissions and evaluation of available control technologies, the following active controls of diffuse and fugitive emissions have been selected for use when practicable during the removal action. The radiological control and environmental organizations are responsible for selecting and ensuring that appropriate controls are implemented to maintain both worker exposure and environmental releases ALARA.

- Radiological surveys (e.g., swipes/smears) will be taken of construction equipment leaving areas where there is the potential for removable surface contamination above 2,000 dpm/100 cm^2 alpha.
- Appropriate controls such as water, fixatives, covers, containment tents, windscreens, or other controls during cessation of work activities will be applied to the extent practicable based on conditions in the work environment (i.e., weather conditions and predicted wind speeds greater than 20 mph).
- Fixatives or cover material (e.g., soil, gravel, and plastic) will be applied to disturbed contaminated soils and debris at any time field activities will be inactive for more than 24 hours. Additionally, if the sustained wind speed is predicted to be greater than 20 mph overnight based on the Hanford Meteorological Station forecast, fixative or cover material will be applied, as practicable.
- Waste containers will remain closed, except during packaging and waste inspection activities.
- As determined by the radiological control organization, contamination survey measurements of the area (e.g., during camera insertions, grout coupling activities, opening risers, etc.) will be taken to control emissions. Measurements will document the average and maximum readings for both beta/gamma and alpha emitters in units of dpm/100 cm^2 and specify removable and fixed survey readings.

C2.3 Monitoring

The quantification of radioactive air emissions and air monitoring have been identified as requirements for the removal action at the Z Belowgrade Structures. There are two components associated with airborne emission monitoring at the structures: point source monitoring, and diffuse and fugitive monitoring. Point source monitoring will be used primarily during field investigation and grouting activities, with diffuse and fugitive monitoring occurring throughout the duration of the project.

As the calculated unabated PTE for the removal action is greater than 0.1 mrem/yr (Section C2.1), continuous emissions monitoring is required by the substantive requirements of WAC 246-247-075. Due to the controls that will be implemented, alternatives will be proposed.

Worksite air monitoring for personnel protection and process monitoring will be the primary indicator of effectiveness of abatement and ALARA control methods during removal activities. Worksite monitoring includes using temporary ambient air monitors (e.g., continuous air monitors with alarms, personnel samplers, ambient air samples). In addition, existing near-facility ambient air monitoring stations surrounding the work areas will augment the workplace monitoring (Section C2.3.2.1).

Periodic confirmatory measurement (PCM) will also be provided as required by the substantive requirements of WAC 246-247-075(3) and (8) for the Z Belowgrade Structures. Ambient air monitoring and radiological surveys will be provided to meet the PCM requirement. The primary PCM will be provided using workspace monitoring and radiological surveys that are performed in accordance with the current radiological control manual. Air monitoring will consist of portable air samplers placed in the

prevailing downwind locations in the immediate work area. The samplers will be operated during work activities that have a potential for radionuclide air emissions. Results are utilized for verifying acceptable occupational conditions and to help confirm effectiveness of contamination controls. Hand-held survey instruments will be used for alpha and beta/gamma contamination surveys.

C2.3.1 Point Source Air Monitoring

Monitoring of point source air emissions for the Z Belowgrade Structures will vary, depending on the type of ventilation system used (active or passive).

C2.3.1.1 Active Ventilation (216Z9 Trench and 241Z361 Tank)

The control methods used for PTRAEU monitoring include the following:

- As determined by the radiological control organization, contamination survey measurements of the area (e.g., during camera insertions, grout coupling activities, opening risers, etc.) will be taken to control emissions. Measurements will document the average and maximum readings for both beta/gamma and alpha emitters in units of dpm/100 cm^2 and specify removable and fixed survey readings.

- Taking removable contamination readings on the effluent port of the HEPA filter. When workers are present, the use of verification (technical smears) will be required daily, when grouting operations are being performed, to validate that contamination control is effective. Ductwork, seams, and potential release locations on the PTRAEUs are to be monitored routinely for potential radionuclide releases. If removable contamination is found above 20 dpm/100 cm^2 alpha or 1,000 dpm/100 cm^2 beta/gamma on the exterior of the HEPA filter or the grout fill piping, work will immediately stop, and the source of the contamination will be investigated and corrected.

- The HEPA filters will be in-place leak tested annually in accordance with a written procedure that addresses testing and visual inspections to meet the intent of ASME N511-2017. The PTRAEU filtration systems shall also be tested when the system is jarred, compromised, modified, and/or opened.

- Nondestructive analysis of the HEPA filter as the alternate monitoring methodology is proposed from each individual filter. This analysis will be performed after completion of the stabilization activity.

C2.3.1.2 Passive Ventilation (216-Z-2 Crib)

An alternate monitoring methodology with periodic verification of controls is proposed due to the passive nature of the emission control device. A passive point source HEPA filter exhausting to the ambient air will be installed on 216-Z-2 Crib as a temporary abatement system for stabilization work. The potential unabated offsite dose associated with the removal action is estimated to be greater than 0.1 mrem/yr. As a result, the controls will be as follows:

- As determined by the radiological control organization, contamination survey measurements of the area (e.g., during camera insertions, grout coupling activities, opening risers, etc.) will be taken to control emissions. Measurements will document the average and maximum readings for both beta/gamma and alpha emitters in units of dpm/100 cm^2 and specify removable and fixed survey readings.

- Taking removable contamination readings on the effluent port of the HEPA filter. When workers are present, the use of verification (technical smears) will be required daily when grouting operations are being performed to validate that contamination control is effective. Ductwork, seams, and potential release locations on the HEPA filter are to be monitored routinely for potential radionuclide releases.

If removable contamination is found above 20 dpm/100 cm^2 alpha or 1,000 dpm/100 cm^2 beta/gamma on the exterior of the HEPA filter or the grout fill piping, work will immediately stop, and the source of the contamination will be investigated and corrected.

- Destructive analysis of the HEPA filter as the alternate monitoring methodology is proposed where the laboratory analyzes a core sample taken from each individual filter used during stabilization activities. The contract laboratory procedure(s) or detailed instructions provided by the contractor will be used by the laboratory to perform the core sampling. The filter coupons will be analyzed individually at the end of the removal action for gross alpha and gross beta/gamma, after which the coupons will be composited for isotopic analysis. Laboratory analytical and quality control protocols will follow NESHAP Method 114 requirements.

C2.3.2 Diffuse and Fugitive Air Monitoring

Diffuse and fugitive radionuclide emissions from the activities described in Appendix A of this document may be monitored using near-facility air monitors or radiological control monitoring, methods of which are described in the following sections.

C2.3.2.1 Near-Facility Air Monitors

The Near-Facility Ambient Air Program stations nearest the Z Belowgrade Structures provide a second layer of monitoring. There are four existing near-facility ambient air monitoring stations surrounding the Z Belowgrade Structures: N165, N433, N554, and N555 (Figure C-1). The near-facility ambient air monitoring stations do not provide real-time data, so their bi-weekly data will be used as indicators along with the worksite monitoring data for overall trending of the effectiveness of the contamination control measures throughout the removal action. During periods of stabilization activities, no more than one of these four monitors will be allowed to be inoperable for more than 24 hr. As part of the site-wide evaluation of NFM data, the electronic release summary database compares NFM 6-month composite air sample results to 10% of Table 2 values in Appendix E of 40 CFR 61. The NFM database identifies results that exceed these values. Results from the air monitors identified in this document that are above these values will be reviewed, the adequacy of the controls evaluated as appropriate, and the U.S. Department of Energy, Richland Operations Office and EPA will be notified.

The well-established Hanford Site protocol for emission monitoring will be followed, including Hanford Site perimeter ambient air data collection, sampling frequencies, sample analysis, and data reporting (DOE/RL-91-50, *Hanford Site Environmental Monitoring Plan*). This method will address the substantive requirements of WAC 246-247-075. Perimeter monitoring is used to measure the diffuse and fugitive emissions from the Hanford Site. Demonstration of compliance with the 40 CFR 61.92, “Standard,” effective dose equivalent of 10 mrem/yr limit is provided by the annual radioactive air emissions report for the Hanford Site (e.g., DOE/RL-2017-17, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2016*).

Figure C-1. Z Belowgrade Structures Near-Facility Monitoring Locations

C2.3.2.2 Radiological Control Monitoring

Radiological control monitoring includes worksite air monitoring and radiological surveys, which are discussed below.

Worksite Air Monitoring. Worksite air monitoring for personnel protection and process monitoring will be the primary indicator of effectiveness of abatement and ALARA control methods during stabilization activities. Worksite air monitoring includes using temporary ambient air monitors (e.g., continuous air monitors with alarms, personnel samplers, and ambient air samples). To support stabilization of the Z Belowgrade Structures, a worksite monitoring network will be established as directed by the radiological control organization with concurrence from the environmental organization. The monitoring network provides the primary emissions data used to ensure that the limits set in the radiological work permit are not exceeded.

Radiological Smear Surveys. Additional monitoring will be conducted during stabilization activities and will consist of radiological surveys in accordance with the current radiological control manual. The surveys will indicate the effectiveness of controls based on gross residual contamination levels. Both alpha and beta/gamma surveys will be performed.

C3 Nonradiological Air Emissions

Requirements are established under WAC 173-400, "General Regulations for Air Pollution Sources," and WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," for the regulation of emissions of criteria and toxic air pollutants or nonradioactive air pollutants. The primary nonradioactive emissions resulting from this removal action will be fugitive particulate matter. In accordance with the substantive requirements of WAC 173-400-040(3) and (8), "General Standards for Maximum Emissions," reasonable precautions will be taken to prevent the release of air contaminants associated with fugitive emissions due to stabilization activities and prevent fugitive dust from becoming airborne from fugitive emission sources.

The constituents of concern for the waste sites under the RD/RAWP (Table 2-1 in DOE/RL-2015-23) consider more than the scope of this work. The chemicals of interest for the three Z Belowgrade Structures covered under this scope of work include boron, carbon tetrachloride, methylene chloride, mercury, and polychlorinated biphenyls, the latter of which will be controlled within the requirements of 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing Processing, Distribution in Commerce, and Use Prohibitions." A soil vapor extraction system was implemented in 1992 as an expedited response action to remove and treat carbon tetrachloride contamination in the vadose zone at the 200-PW-1 OU waste sites. Previous use of the soil vapor extraction system is believed to have removed sufficient quantities of volatile and toxic chemicals from the soil so that soil concentrations will be below levels listed in WAC 173-460-150, "Table of ASIL, SQER and de Minimis Emission Values" (Section 5.1.1.6 in DOE/RL-2015-23). As a conservative measure, carbon filtration will be installed in the ducting to the PTRAEU to control potential criteria and toxic air emissions from the bottom of the 241Z361 Tank. Carbon filtration will also be installed in the ventilation ducting at the 216Z9 Trench, as it has also received carbon tetrachloride.

Operating trucks and other diesel-powered equipment during the removal activities would be expected in the short term to introduce quantities of sulfur dioxide, nitrogen dioxide, particulates, and other pollutants to the atmosphere, typical of similar sized construction projects. These releases would not be expected to exceed air quality standards. Dust generated during stabilization activities would be minimized by applying water or other dust control measures (e.g., fixatives). Vehicular and equipment emissions will be mitigated in compliance with the substantive standards for air quality protection that

apply to the Hanford Site. These techniques are considered reasonable precautions to control fugitive emissions as required by the substantive requirements of air emissions ARARs.

The use of treatment technologies that would result in emissions of toxic air pollutants that would be subject to the substantive applicable requirements of WAC 173-460 are not anticipated to be a part of this removal action. Treatment of some waste encountered during this removal action may be required to meet Environmental Restoration Disposal Facility waste acceptance criteria. In most cases, the type of treatment anticipated would consist of solidification and stabilization techniques such as macroencapsulation or grouting, and WAC 173-460 would not be considered an ARAR. If more aggressive treatment is required that would result in the emission of regulated air pollutants, the substantive requirements of WAC 173-400-113(2), "New Sources in Attainment or Unclassifiable Areas—Review for Compliance with Regulations," and WAC 173-460-060, "Control Technology Requirements," would be evaluated to determine applicability.

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