EXPLANATION OF SIGNIFICANT DIFFERENCE FOR THE 100-NR-1 OPERABLE UNIT TREATMENT, STORAGE, AND DISPOSAL INTERIM ACTION RECORD OF DECISION AND 100-NR-1/100-NR-2 OPERABLE UNIT INTERIM ACTION RECORD OF DECISION

January 2003

SITE NAME AND LOCATION

U.S. Department of Energy 100 Areas
100-NR-1 and 100-NR-2 Operable Units, Hanford Site
Benton County, Washington

INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE

The Washington State Department of Ecology (Ecology), U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE), hereinafter referred to as the Tri-Parties, are issuing this Explanation of Significant Difference (ESD) to provide public notice on changes to two Records of Decision (RODs) issued for the 100-N Operable Unit (OU), located on the Hanford Site. The two RODs are as follows:

- *Interim Remedial Action Record of Decision for the 100-NR-1 Operable Unit of the Hanford 100-N Area*[1] (Treatment, Storage, and Disposal [TSD] ROD)

- *Interim Remedial Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units*[2] (100-NR-1/100-NR-2 ROD).

The TSD ROD addresses contaminated soils, structures, and pipelines associated with two TSD units in the 100-NR-1 OU: the 116-N-1 and 116-N-3 waste sites (Figure 1). The 100-NR-1/ 100-NR-2 ROD addresses all of the other remaining soil waste sites in the 100-NR-1 OU, as well as the 100-NR-2 groundwater OU. EPA, Ecology, and DOE approved the TSD ROD in January 2000, and the 100-NR-1/100-NR-2 ROD was approved in December 1999.

This ESD is required for the following reasons:

1. The selected remedy in the TSD ROD allows for consideration of eight “balancing factors” to determine the extent of additional excavation needed in situations where residual contamination exists below the engineered structure and at a depth greater than 4.6 m (15 ft). The TSD ROD selected remedy also states, “The application of the criteria for the balancing factors will be made by EPA and Ecology on a site-by-site basis.” The Tri-Parties agreed to

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[1] EPA, Ecology, and DOE, 2000, *Interim Remedial Action Record of Decision for the 100-NR-1 Operable Unit of the Hanford 100-N Area, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington (also known as the “TSD ROD”).
[2] EPA, Ecology, and DOE, 1999, *Interim Remedial Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units of the Hanford 100-N Area, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington (also known as the “100-NR-1/100-NR-2 ROD”).

invoke the balancing factor analysis at the 116-N-1 waste site only to determine the extent of additional excavation at a depth greater than 4.6 m (15 ft) through preparation of this ESD.

2. To revise the annual institutional control (IC) reporting requirement in both the TSD ROD and 100-NR-1/100-NR-2 ROD selected remedies consistent with the reporting requirements contained in the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*[3].

The TSD ROD included a remedial action objective (RAO) that residual contamination will not exceed maximum contaminant levels (MCLs) for protection of groundwater. The ROD stated that protection could be demonstrated using modeling. The Tri-Parties previously agreed to use certain standard assumptions in the RESidual RADioactivity (RESRAD) model. One standard assumption is 76 cm/yr (30 in./yr) of irrigation. This ESD provides notice and justification for a change removing the irrigation assumption from the modeling at the 116-N-1 waste site, as well as prohibiting irrigation based on the balancing factor evaluation.

The “balancing factors” are a set of eight criteria specified in the TSD ROD and are provided in Table 1 of this ESD. Because this interim action will leave residual contamination at a depth greater than 4.6 m (15 ft), a “balancing factors” evaluation was performed to determine the extent of remediation. The balancing factors evaluation (Table 1) indicates that ICs as required by the TSD ROD, including a prohibition on irrigation, will protect human health and the environment. The reasonably expected future uses of this area do not include uses involving irrigation. The TSD ROD is changed to include a prohibition on irrigation consistent with the balancing factors criteria.

Additionally, the TSD ROD and 100-NR-1/100-NR-2 ROD require submittal of a report on the effectiveness and implementation of ICs for the 100-NR-1 and 100-NR-2 OUs to Ecology by July 31 for the preceding calendar year. This ESD shall allow the annual IC reporting requirement to be performed as part of the annual Sitewide IC report. The DOE will comply with both ROD requirements to submit an annual IC report by including the information in the annual Sitewide IC report. This report is required by the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*. This change is consistent with EPA’s 5-year ROD review conducted in 2001.

The Tri-Parties are issuing this ESD in accordance with Section 117(c) of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) and Sections 300.435(c)(2)(i) and 300.825(a)(2) of the “National Oil and Hazardous Substances Pollution Contingency Plan” (NCP). The ESD allows for changes to an approved remedy that does not fundamentally alter the overall cleanup approach. The purpose is to provide public notice on the significant changes identified above and the information that led to making the changes. Following a 30-day public comment period, the Tri-Parties will consider public comment before issuing the ESD. The ESD will become part of the Administrative Record for the cleanup decision for the 100-N Area of the Hanford Site. The Administrative Record is available for review at the following location:

[3] DOE-RL, 2002, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*, DOE/RL-2001-41, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Administrative Record
2440 Stevens Center Place, Room 1101
Richland, Washington 99352
(509) 376-2530
Attention: Debbi Isom

Application of the Criteria for Balancing Factors to Determine Extent of Remediation

Cleanup activities to remove, treat, and dispose the top 4.6 m (15 ft) in the 116-N-1 waste site are in progress. This site is contaminated with cesium-137, cobalt-60, europium-154, europium-155, plutonium-239/240, strontium-90, and other contaminants. Under the TSD ROD, removal of contamination below 4.6 m (15 ft) is also discussed. Previous evaluation in the *100-NR-1 Treatment, Storage, and Disposal Units Corrective Measures Study/Closure Plan*[4] (CMS/CP) indicates that removal of contaminated soil to a depth of 4.6 m (15 ft) would meet the RAOs specified in the TSD ROD, including the RAO for groundwater protection for contamination below 4.6 m (15 ft). However, based on further evaluation of data below 4.6 m (15 ft) from boreholes drilled in 1996 in the 116-N-1 waste site, using the RESRAD model with irrigation, the MCL for strontium-90 would be exceeded and does not meet the RAO for protection of groundwater.

Figure 2 shows a conceptual model of the 116-N-1 waste site. Based on the application of RESRAD, the waste site is divided into three separate layers for modeling to demonstrate compliance with the RAOs. "Layer A" averages approximately 1,802 pCi/g of strontium-90. "Layer B" averages approximately 791 pCi/g of strontium-90, while concentrations in "Layer C" average approximately 78 pCi/g of strontium-90. The average strontium-90 concentration in the excavation area above Layer A is 2,597 pCi/g, which will be removed and disposed. The RESRAD modeling results show that soil contamination only in Layer C (Figure 2) would cause strontium-90 to exceed the MCL for protection of the groundwater. The MCL for strontium-90 in the groundwater is 8 pCi/L, and the RESRAD model calculates a discharge concentration of strontium-90 to the groundwater interface of 37.5 pCi/L. Based on these results, excavation would need to continue an additional 20 m (65 ft) to the groundwater table to remove Layer C. No additional radionuclides or chemicals remaining in Layer A, Layer B, or Layer C would exceed the standards for protection of groundwater.

The rural-residential exposure scenario presented in the TSD ROD assumes the application of 0.76 m/yr (30 in./yr) of irrigation water from an offsite, uncontaminated source. The RESRAD modeling results show that the modeled strontium-90 discharge to groundwater without irrigation is 5.5 pCi/L, which achieves the RAO and is below the MCL of 8 pCi/L for strontium-90.

The TSD ROD states:

> *Institutional controls and long-term monitoring will be required where wastes are left in place and preclude an unrestricted land use. Institutional controls selected as part of this remedy are designed to be consistent with the interim action nature of this ROD.*

[4] DOE-RL, 1998, *100-NR-1 Treatment, Storage, and Disposal Units Corrective Measures Study/Closure Plan*, DOE/RL-96-39, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Additional measures may be necessary to ensure long-term viability of institutional controls if the final remedial actions selected for the 100 Area does not allow for unrestricted land use. Any additional controls will be specified as part of the final remedy.

The TSD ROD and 100-NR-1/100-NR-2 ROD waste sites will remain under the control of DOE for the remaining duration of the interim remedial action. The ICs will be maintained in accordance with both RODs and DOE's Sitewide IC plan. Pursuant to this ESD, those controls now include a prohibition on irrigation only at the 116-N-1 waste site. Additional ICs may be required as part of the final remedial action to ensure long-term viability of ICs.

Revision of the Annual Institutional Controls Reporting Requirement (TSD ROD and 100-NR-1/100-NR-2 ROD)

The TSD ROD and 100-NR-1/100-NR-2 ROD state that a report on the implementation and effectiveness of ICs for the 100-NR-1 and 100-NR-2 OUs shall be submitted to Ecology by July 31 for the preceding calendar year. However, the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions,* approved by the Tri-Parties in July 2002, establishes an annual Sitewide IC report due in July 2003, and by September 30 each year thereafter.

This ESD revises the reporting requirements for the TSD ROD and the 100-NR-1/100-NR-2 ROD to allow DOE to fulfill the annual IC reporting requirements for the 100-NR-1 and 100-NR-2 OUs as part of the required annual reporting on Sitewide ICs.

SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

The 116-N-1 and 116-N-3 waste sites received radioactive liquid waste containing activation and fission products, as well as small quantities of corrosive liquids and laboratory chemicals generated by various N Reactor operations (Figure 1). The 116-N-1 waste site, which was in operation from 1963 to 1985, is 88 m (290 ft) long by 38 m (125 ft) wide by 1.5 m (5 ft) deep. The contaminants of concern in the surface soils were derived from data in the *100-NR-1 Treatment, Storage, and Disposal Units Corrective Measures Study/Closure Plan*. The radionuclides of concern include cesium-137, cobalt-60, europium-154, europium-155, plutonium-239/240, strontium-90, and tritium. The 116-N-1 waste site is actively undergoing remediation, which began in October 2001. Contaminated soil in the top 4.6 m (15 ft) is being removed and disposed as required by the TSD ROD. This represents a significant mass of the contamination, as nearly 130,000 tons of contaminated soil have been removed and disposed to date, with an additional 120,000 tons of contaminated soil removal expected over the next 18 months. This contamination removal in the top 4.6 m (15 ft) represents approximately 3,283 Ci. This action complies with the TSD ROD requirement for removing the contamination in the top 4.6 m (15 ft) below surrounding grade or the bottom of the engineered structure, which contains a significant inventory.

The 116-N-3 waste site operated from 1983 to 1993 and is 76 m (250 ft) by 73 m (240 ft) by 1.3 m (4 ft). Remediation of the 116-N-3 site was completed in 2001, and approximately 154,578 tons of contamination were removed and disposed. Cleanup actions meet the requirements (i.e., RAOs) of the TSD ROD using the RESRAD model with irrigation applied.

The 100-NR-2 groundwater OU, which is contaminated with strontium-90, runs beneath the 116-N-1 waste site, as well as the entire 100-N Area. A pump-and-treat system has been operating for over 5 years. The system creates a hydraulic barrier, thereby reducing the amount of strontium-90 contamination entering the Columbia River. The extracted groundwater is treated to remove approximately 90% of the strontium-90 withdrawn from the aquifer, and the treated water is reinjected farther away from the Columbia River. Operation of the pump-and-treat system is expected to continue as required by the 100-NR-1/100-NR-2 ROD. The strontium-90 concentrations in the groundwater have been detected as high as 14,700 pCi/L but the current, average concentration is approximately 2,000 pCi/L.

The selected remedies established in both the existing TSD ROD and 100-NR-1/100-NR-2 ROD remain unchanged, with the exception that this ESD removes the July 31 annual IC reporting requirement in both RODs and requires the report to be submitted as part of the annual Sitewide IC report required by the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions.* Additionally, this ESD requires ICs to include the prohibition of irrigation at the 116-N-1 waste site. The presumed application of 76 cm (30 in.) of irrigation in the rural-residential exposure scenario (TSD ROD) for the 116-N-1 waste site will therefore be eliminated.

The prohibition on irrigation for the 116-N-1 waste site remains consistent with the reasonably expected future land use based on the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (CLUP)[5] and the Hanford Reach National Monument. In order to reserve the Hanford Reach for the purpose of protecting the ecological, cultural, natural resources, and lands, President William Jefferson Clinton established the Hanford Reach National Monument. This action occurred after the issuance of the TSD ROD.

The purpose of the CLUP is to facilitate the decision-making process regarding the Hanford Site's uses and facilities over at least the next 50 years. Additionally, the overall goal of the CLUP is to balance the continuing land-use needs at the Hanford Site with the desire to preserve important ecological and cultural values of the Site and allow for economic development. The *Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)*[6] (CLUP ROD) identifies the 100-NR-1 OU within the geographic area of the Columbia River Corridor. The remediation and restoration efforts in the Columbia River Corridor are expected to return the lands to undeveloped, natural conditions over the next 75 years. Restrictions on certain activities may continue to be required to prevent the mobilization of contaminants, the most likely example of which is the restriction of activities that discharge water to the soil or involve excavating below 4.6 m (15 ft). The CLUP identifies the 100-N Area as a "preservation" land-use designation. The preservation land-use designation specifies the management of the land for the preservation of archeological, cultural, ecological, and natural resources, while prohibiting new consumptive uses (mining) and limiting public access.

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[5] DOE, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, DOE/EIS-0222F, U.S. Department of Energy, Washington, D.C.

[6] EPA, Ecology, and DOE, 1999, *Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.

BASIS FOR THE DOCUMENT

The RESRAD modeling indicated that the lowest soil column layer beneath the 116-N-1 waste site (Layer C, Figure 2) contributes 37.5 pCi/L of strontium-90 to the groundwater, which exceeds the 8 pCi/L MCL for strontium-90 if 76 cm (30 in.) of irrigation per year is presumed. However, applying the RESRAD model without presuming irrigation shows strontium-90 levels leaching to the groundwater of 5.5 pCi/L, which meets the MCL of 8 pCi/L for strontium-90.

The TSD ROD identifies eight balancing factors to determine the extent of additional excavation needed in situations where residual contamination is present below the engineered structure at a depth greater than 4.6 m (15 ft). Four remedial technologies and methods were screened for further evaluation through the balancing factor analysis: (1) excavation to groundwater by conventional methods currently deployed at the 116-N-1, (2) excavation to groundwater by soil augering, (3) a subsurface barrier, and (4) the use of ICs to prevent irrigation. These methods (other than the currently deployed conventional excavation) were chosen in order to provide a basis for comparing the balancing factor data and completing the evaluation, and not for the purposes of selecting a new remedy. This evaluation is summarized in Table 1 of this ESD. A summary of the assumptions used in cost estimation for the excavation and containment methods is presented in Appendix A of this ESD.

Additionally, DOE performed research on the availability of remote excavation technology and identified three primary areas of application: decontamination and decommissioning (D&D), unexploded ordnance, and mining.

Remotely controlled excavators are commonly used for D&D of radioactively contaminated sites where there is a high dose rate. They are also used at Department of Defense sites where unexploded ordnance is present. Worker safety is the primary concern in both applications, so the technology is not required to show “high” production rates or “low” costs compared to industry standards for the excavation of hazardous waste or radioactive low-level waste. Standard cost-estimating databases (e.g., RS Means and U.S. Army Corp of Engineers databases) do not include production rates and unit costs for these technologies because they are nonstandard applications. The lack of a cost basis constitutes excluding these technologies from the balancing factor analysis; however, DOE collected information on operating experience to continue the evaluation.

Remotely operated excavators have been used at both the Idaho National Engineering and Environmental Laboratory (INEEL) and at the 100-F Area of the Hanford Site. INEEL staff stated that, as a general rule of thumb, using remotely operated excavators costs four times more than using conventional methods. Based on field experience at Hanford’s 100-F Area, the remote excavation equipment experienced frequent breakdowns and was difficult to keep operational for extended periods of time. Field staff also indicated severe limitations when using remote excavators at a large-scale soil excavation sites such as at the 116-N-1 waste site. The remote equipment in use at the 100-F Area provides an excavator bucket capacity of 0.19 m^3 (0.25 yd^3), while conventional equipment routinely has a capacity of approximately 2.7 m^3 (3.5 yd^3); production rates would be substantially lower with remotely operated equipment. One Department of Defense site used remote excavation on a much smaller scale than at 116-N-1 and calculated a production rate of 241 tons per day. Excavation to groundwater at the 116-N-1 waste site would require removal of an additional 458,561 tons of soil. This would require 1,902 working days based on the production rate of 241 tons per day, which equates to an additional 7 years to complete. This qualitative analysis provided an additional basis to dismiss evaluation of remotely operated equipment through the balancing factor analysis in this ESD.

Conventional mining technology is not typically considered a remote excavation technology. However, dragline mining offers some advantages similar to remote excavation, because the operator stays outside the excavation (potentially reducing radiation dose), and the equipment has a long operating radius. Dragline equipment uses a large "clamshell"-type bucket that has bucket capacity, production rates, and unit costs equal to or better than conventional backhoe-type excavating equipment. However, dragline equipment has some key disadvantages that make it unsuitable for use at the 116-N-1 waste site. A dragline bucket is unloaded by dropping material into a container or truck, and a substantial amount of material drops outside the truck as part of the design. With the radioactive contamination present at 116-N-1, use of this technology increases the spread of radioactive contamination, increases the amount of equipment decontamination necessary, makes equipment decontamination more complicated and expensive, increases requirements for worker personal protective equipment (PPE), and may require additional controls to comply with radioactive air emission standards. The use of dragline equipment for radioactive materials would increase the amount of water required for equipment decontamination and dust control, potentially flushing contamination from the contaminated soil to the groundwater. This qualitative analysis provided the basis to dismiss evaluation of dragline equipment through the balancing factor analysis in this ESD.

Excavation to groundwater using conventional methods uses heavy equipment to excavate contaminated soil that is loaded into containers and disposed at the Environmental Restoration Disposal Facility (ERDF). Excavation to groundwater using soil augering involves equipment commonly used in soil and bridge foundation emplacement. A large-diameter (up to 2 m [6.6 ft]) auger penetrates the earth to the desired depth while a steel casing is advanced. The auger rotates, displacing the soil to the surface where the soil empties out of the top of the steel casing and is containerized and sent to ERDF. A cementaceous grout is pumped into the casing as the casing is removed, and the rig is moved to an adjacent starting point. This process is repeated until the bulk of the desired area has been augered.

A subsurface barrier is a series of layers that prevent potential irrigation water from contacting the contaminated soil below the barrier. The subsurface barrier model for this ESD includes a small grading fill layer at the excavation bottom to create a slight dome, a 0.6-m (2-ft)-thick clay layer, a high-density polyethylene (HDPE) liner, and clean backfill placed in the bottom of an excavated trench. The barrier design includes excavating additional soil at the bottom and projecting an additional 6 m (20 ft) from the side of the waste site. Cost estimates include simulation modeling of the effectiveness of the subsurface barrier. Subsurface probes and geophysical methods could monitor actual barrier performance. While a subsurface barrier minimizes the amount of strontium-90 leached to the groundwater with irrigation applied, the impacts to the ecological and cultural resources are similar to those from excavation methods because of the additional excavation needed to ensure that the barrier fully covers the waste site (an additional 6 m [20 ft]). The 6-m (20-ft) overlap is necessary to prevent recharge under the barrier based on results of monitoring at the Hanford prototype barrier in the 200 Areas.

The ICs consist of physical measures and administrative and legal controls, as identified in the RODs, to prevent unauthorized access or use of a specific site or location. An annual report is required to document effectiveness of the ICs, including any deficiencies and corrective actions.

The balancing factors analysis determined that both methods of excavation to groundwater (1) had significant impacts to the protection of human health and the environment and worker safety, (2) had the potential to impact the sizing of the ERDF by requiring nearly an entire new ERDF cell to accommodate the added waste volumes, and (3) significantly increase the cost of remediation and duration. Impacts to human health and the environment include worker exposure to significant radiation doses and the requirement for additional backfill material to establish new borrow pits, resulting in excavation of additional undisturbed land that could potentially impact ecological or cultural resources. Impact to the environment from excavating to groundwater are significant because at those depths, a 2:1 slope would be required to prevent cave-in of soil material for worker protection. Additionally, this would increase the surface footprint needed to excavate deep, which would result in the partial destruction of the *Mooli-Mooli*, which are a series of geologic knobs and kettles caused by cataclysmic flooding that are culturally significant to the Wanapum located near the end of 116-N-1.

The statements relating the significance of *Mooli-Mooli* are attributed to the Wanapum because they have specifically expressed their views opposing destruction during consultations relating to the remedial action. Based on discussions with the Wanapum, the *Mooli-Mooli* is a cultural landscape that contains legends, stories, and spiritual power that remain important in continuance of their religion, traditions, and heritage. It is an area where youths, as young as 5 to 6 years of age, were sent to conduct vision quests, which is a practice they would follow throughout their lifetime in age-specific locations within the Hanford Site and the Columbia Basin. The mounds are a traditional place of power. The *Mooli-Mooli* also has cultural and religious significance to other Native American communities with ancestral ties to the Hanford Site, such as the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, and the Yakama Nation.

The balancing factors analysis demonstrates that the use of ICs to prohibit irrigation rather than excavating additional contaminated soil below 4.6 m (15 ft) prevents an additional 11,000 mrem worker exposure to radiation, remains protective of human health and the environment, is cost-effective, does not add additional ERDF cells, and does not negatively impact ecological or cultural resources (e.g., the *Mooli-Mooli*). The balancing factors analysis is also consistent with the reasonably expected future land use identified in the CLUP ROD. The CLUP ROD identifies the 100-N location as a preservation area and also states that it may be necessary to restrict certain activities to prevent the mobilization of contaminants, the most likely example of which is the restriction of activities that discharge water to the soil or involve excavating below 4.6 m (15 ft). Therefore, prohibiting irrigation at the 116-N-1 waste site is consistent with the CLUP ROD. Furthermore, preserving the *Mooli-Mooli* cultural resource is also consistent with the Executive Order for the Hanford Reach National Monument.

DESCRIPTION OF SIGNIFICANT DIFFERENCES

TSD ROD:

1. Add to the selected remedy, "DOE shall prohibit irrigation at the 116-N-1 waste site and eliminate irrigation from modeling at 116-N-1, based on the approved ESD, which identifies additional excavation greater than 4.6 m (15 ft) is not required."

2. Revise the annual institutional controls reporting requirement in the selected remedy to state, "DOE will evaluate the implementation and effectiveness of institutional controls for the 100-NR-1 Operable Unit on an annual basis. The DOE shall submit a report to EPA and Ecology by July 31 of each year, or as required by the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Action,* summarizing the results of the evaluation for the preceding calendar year. At a minimum, the report shall contain an evaluation of whether or not the institutional control requirements continue to be met and a description of any deficiencies discovered and measures taken to correct problems."

100-NR-1/100-NR-2 ROD:

1. Revise the annual institutional controls reporting requirement in the selected remedy to state, "DOE will evaluate the implementation and effectiveness of institutional controls for the 100-NR-1 Operable Unit on an annual basis. The DOE shall submit a report to EPA and Ecology by July 31 of each year, or as required by the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Action,* summarizing the results of the evaluation for the preceding calendar year. At a minimum, the report shall contain an evaluation of whether or not the institutional control requirements continue to be met and a description of any deficiencies discovered and measures taken to correct problems."

SUPPORT AGENCY COMMENTS

By issuance of this ESD, the Tri-Parties concur with the significant differences identified above and the balancing factors analysis.

STATUTORY DETERMINATIONS

This modified remedy satisfies CERCLA Section 121. The interim remedy selected in the TSD ROD and the 100-NR-1/100-NR-2 ROD, as modified by this ESD, remains protective of human health and the environment, complies with Federal and state requirements that are applicable or relevant and appropriate to remedial actions, is cost-effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable.

PUBLIC PARTICIPATION

The public participation requirements set forth in Section 300.435(c)(2)(i) of the NCP are met through issuance of this ESD. In addition, a 30-day public comment period is being provided in accordance with the TSD ROD prior to making a final determination.

Table 1. Balancing Factors Analysis.

Balancing Factor Criteria	Excavation with Conventional Methods to Groundwater and Maintain Irrigation (30 in./yr)	Excavation with Soil Augering to Groundwater and Maintain Irrigation (30 in./yr)	Subsurface Barrier and Maintain Irrigation (30 in./yr)	Prohibit 30-in./yr Irrigation (30-in./yr) and Maintain Institutional Controls
1. Reduction in Risk by Decay of Short-Lived Radionuclides (half-life less than 30.2 years). Is the radionuclide short-lived?	All contaminated soil is removed and no additional risk reduction occurs from radioactive decay.	All contaminated soil is removed and no additional risk reduction occurs from radioactive decay.	Contaminated soil remains below the barrier, but the barrier prevents mobilization of soil contaminants to ensure protection of the groundwater. Additional risk reduction occurs due to radioactive decay of strontium-90 as well as cesium-137 and cobalt-60.	Contaminated soil remains at depths greater than 4.6 m (15 ft), but without irrigation to mobilize contamination, the groundwater is protected. Additional risk reduction occurs due to radioactive decay of strontium-90 as well as cesium-137 and cobalt-60.
2. Protection of Human Health and the Environment	This method is protective but requires extensive backfill material due to the extent of excavation, which requires additional borrow pits. This would incur added environmental damage to undisturbed areas.	This method is protective but requires extensive backfill material due to the extent of excavation, which requires additional borrow pits. This would incur added environmental damage to undisturbed areas.	This method is protective in reducing the amount of water leaching strontium-90 into the groundwater. No additional borrow pits would be necessary for backfilling the excavated area.	This method is protective in that prohibiting irrigation prevents leaching of soil contaminants and ensures groundwater protection. No additional borrow pits would be necessary for backfilling the excavated area.
3. Remediation Costs (estimated)	$54.3 million (32 additional months to complete).	$105.1 million (62 additional months to complete).	$5.7 million (12 additional months to complete).	Minimal cost is necessary to maintain and ensure institutional controls.
4. Sizing of the ERDF	ERDF expansion necessary. Approximately 0.75 new cells would be used to accept additional waste from the 116-N-1 site.	ERDF expansion necessary. Approximately 0.6 of new cells would be used to accept waste from the 116-N-1 site.	ERDF expansion not necessary from the minimal additional waste from the additional 6 m (20 ft) to ensure that the barrier covers the waste site.	ERDF expansion not necessary.
5. Worker Safety	Safety concerns with extensive personal protective equipment (PPE) required (Anti-Cs and industrial safety). Radiation exposure is estimated at 11,000 people-mrem.	Safety concerns with extensive PPE required (anti-Cs and industrial safety). Radiation exposure is estimated at 500,000+ people-mrem.	Radiation exposure is estimated at <500 people-mrem.	No additional worker exposure to radiation, and safety concerns are minimized.
6. Presence of Ecological and Cultural Resources	Soil removal would impact the *Mooli-Mooli* (east end of 116-N-1) without extensive and costly shoring. This cost is not included above. The Wanapum do not want the *Mooli-Mooli* impacted.	Augering would have minimal impact to the *Mooli-Mooli*.	Barrier installation would have minimal impact to the *Mooli-Mooli*.	No impacts occur to the *Mooli-Mooli*.
7. Use of Institutional Controls (ICs)	Institutional controls identified in the TSD ROD would remain unchanged.	Institutional controls identified in the TSD ROD would remain unchanged.	Institutional controls identified in the TSD ROD would remain unchanged, but other ICs may be necessary in the final ROD to protect the barrier.	Institutional controls identified in the TSD ROD would remain unchanged, but one additional IC is added to prohibit irrigation at the 116-N-1 waste site.
8. Long-Term Monitoring Costs	No impact.	No impact.	Cost is included above in row 3.	No impact.

Figure 1. 100-NR-1 Operable Unit.

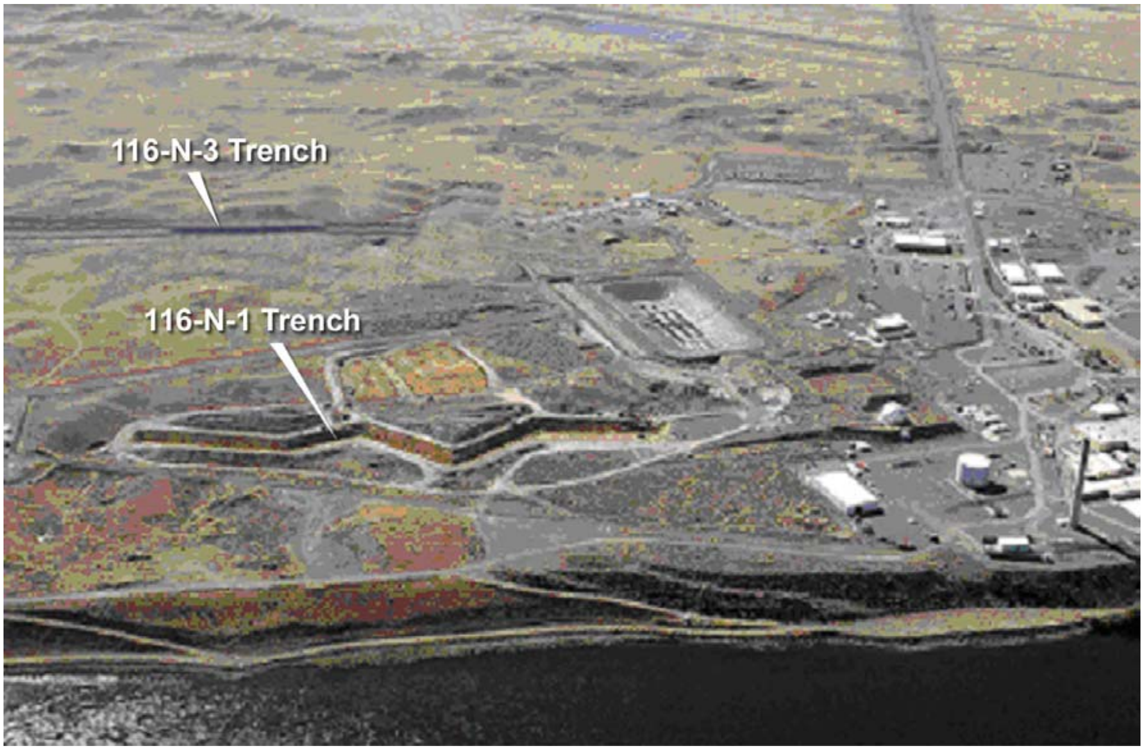
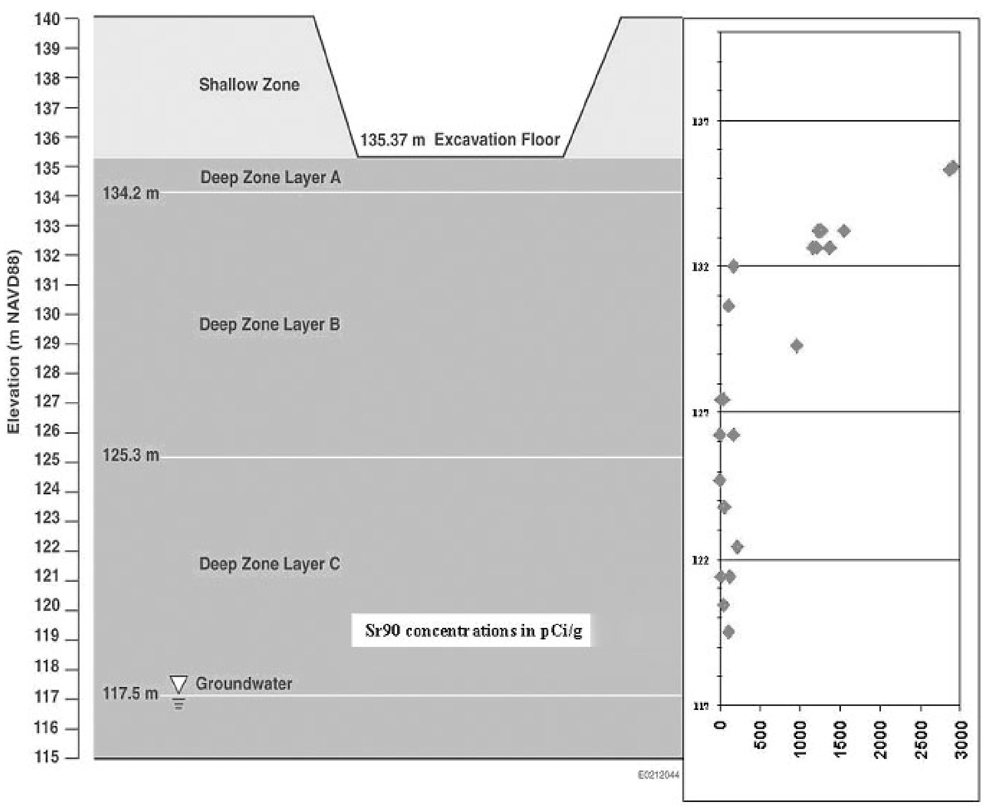


Figure 2. 116-N-1 Conceptual Subsurface Cross-Section.



APPENDIX A

ASSUMPTION SUMMARY INFORMATION

Table A-1. Assumption Summary: Excavation to Groundwater (Conventional).[a]

Item	Assumption
Excavate and stockpile clean overburden, then return to excavation	Assumes 2:1 slope.
Excavate and stage for transport contaminated soil	Assumes that entire footprint and additional 30% of soil beyond excavation footprint is contaminated.
Transport and disposal of contaminated soil in the ERDF	Assumes 458,562 additional tons transported and disposed and construction of ERDF capacity.
Backfill from onsite borrow pit	Assumes borrow pit less than 6 km from waste site.
Project support	Includes radiation control technician, health and safety, field oversight, engineering and environmental, waste management, and sampling and analytical costs for the 32-month duration.

[a] Assumes traditional excavation methods currently used. Generalized conceptual excavation cross section shown below.

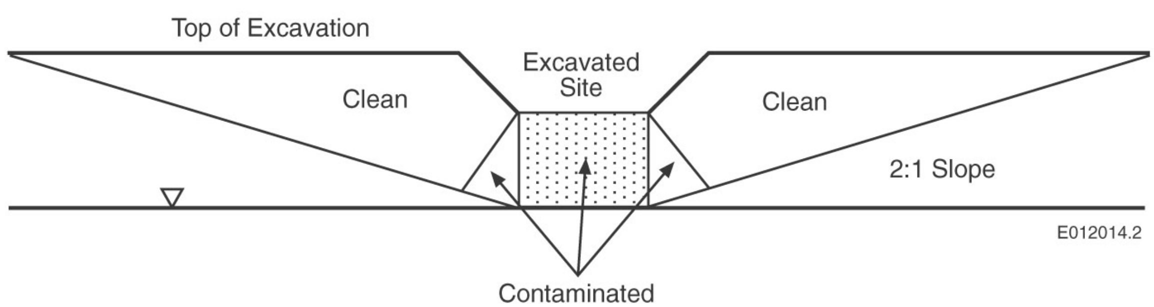


Table A-2. Assumption Summary: Soil Removal by Augering to Groundwater.[a]

Item	Assumption
Augering	Assumes 2-m-diameter holes with 1-m-diameter holes in between. This equates to approximately 2,283 holes (2 m each), and 2,553 holes (1 m each) over the entire excavation footprint.
Grouting	Grout displaces soil in the holes. Assumes a batch plant is set up onsite.
Transport and disposal of contaminated soil in the ERDF	Assumes 349,007 additional tons transported and disposed and construction of ERDF capacity.
Project support	Includes radiation control technician, health and safety, field oversight, engineering and environmental, waste management, and sampling and analytical costs for the 62-month duration.

[a] Four large bore (2-m) machines used in this estimate. Only 98% of the contaminated soil will be removed due to the circular nature of holes. Basic layout pattern is shown below.

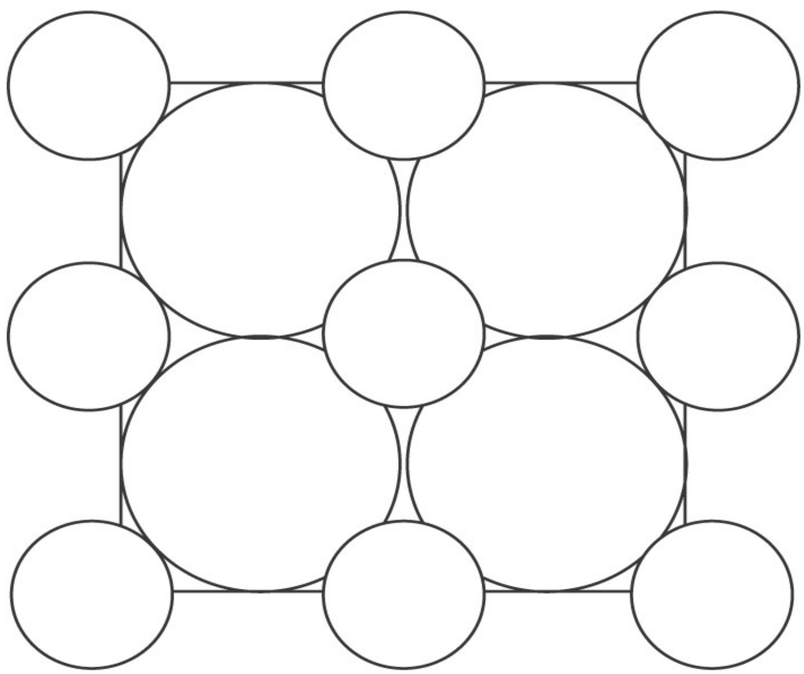
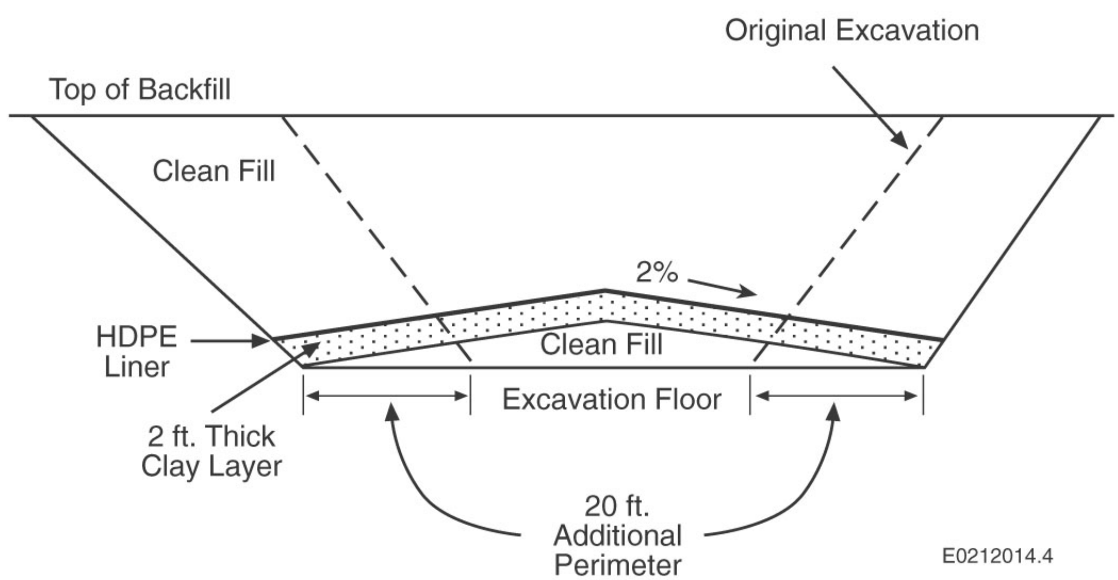


Table A-3. Assumption Summary: Subsurface Barrier.[a]

Item	Assumption
Excavate and stockpile clean overburden, then return to excavation	Assumes 1.5:1 slope, removal of additional 20-ft perimeter around entire waste site to reduce lateral infiltration.
Excavate, transport, and disposal of contaminated soil in the ERDF	Assumes 6,392 additional tons of contaminated soil transported and disposed and construction of ERDF capacity.
Backfill lowest layer from onsite borrow pit	Assumes borrow pit less than 6 km from waste site.
Install 2-ft clay liner excavation	*RS Means Environmental Cost Data*.
Install 80-mil HDPE geotextile liner above clay layer	*RS Means Environmental Cost Data*.
Project support	Includes radiation control technician, health and safety, field oversight, engineering and environmental, waste management, and sampling and analytical costs for the 12-month duration.

[a] Generalized conceptual cross section shown below.



Signature sheet for the *Explanation of Significant Difference to the 100-NR-1 Operable Unit Treatment, Storage, and Disposal Interim Action Record of Decision and the 100-NR-1/ 100-NR-2 Operable Unit Interim Action Record of Decision* between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

___________________________________ __________________
Mike Gearheard Date
Regional Administrator, Region 10
U.S. Environmental Protection Agency

Signature sheet for the *Explanation of Significant Difference to the 100-NR-1 Operable Unit Treatment, Storage, and Disposal Interim Action Record of Decision and the 100-NR-1/ 100-NR-2 Operable Unit Interim Action Record of Decision* between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

________________________________ _________________

Keith Klein Date
Manager, Richland Operations
U.S. Department of Energy

Signature sheet for the *Explanation of Significant Difference to the 100-NR-1 Operable Unit Treatment, Storage, and Disposal Interim Action Record of Decision and the 100-NR-1/ 100-NR-2 Operable Unit Interim Action Record of Decision* between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

_______________________________________ __________________

Michael Wilson — Date

Program Manager, Nuclear Waste Program

Washington State Department of Ecology