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# Action Memorandum

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**Site Name and Location:**
United States Department of Energy
100 Area, 105-N Reactor Facility and 109-N Heat Exchanger Building
Hanford Site
Benton County, Washington

## Introduction

This Action Memorandum documents approval of the United States Department of Energy's (USDOE) proposed removal action of interim safe storage (ISS) of the 105-N Reactor Facility and 109-N Heat Exchanger Building, as describe herein, to mitigate the potential hazards associated with that facility. The removal plan includes decontamination and decommissioning of portions of the facilities and construction of a safe storage enclosure over the 105-N Reactor block and the 109-N steam generator cells and pipe gallery.

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A 30-day comment period was held from October 20, 2004, to November 19, 2004, for public review of the Engineering Evaluation/Cost Analysis (EE/CA) that provides an analysis of the alternatives for this removal action as well as the facility specific information available in the Administrative Record. All comments received generally supported implementation of this action. The comments and responses are provided in Appendix B.

This removal action reduces the potential for a release of hazardous substances that could adversely affect public health or welfare and the environment, and is protective of on-site personnel.

## I. Purpose and Scope

The purpose of this non-time critical removal action is to mitigate threats to onsite workers and personnel, public health or welfare, and the environment by placing the 105-N and 109-N facilities in safe storage for up to 64 years[1], until final reactor disposition occurs. The facilities within the scope of this evaluation are the 105-N Reactor Building (105-N) and the 109-N Heat Exchanger Building (109-N).

[1] The approximate 64 year duration reflects the anticipated time for final disposition of other Hanford site reactor facilities.

## II. Background and Facility Description

The N Reactor facility is located in the 100-N Area on the Hanford Site, located along the southern shore of the Columbia River in southeastern Washington State. The area houses the 105-N Reactor, support facilities such as water treatment facilities, administrative office buildings, laboratories, maintenance shops, and utility structures. The 105-N Reactor served a dual mission, producing special nuclear materials and providing steam to generate electricity. The reactor ceased operations in 1987; preservation efforts were stopped in 1991. Facility deactivation was completed in July 1998, which placed the facilities in a safe and stable condition, minimizing the long-term cost of surveillance and maintenance (S&M) and protecting workers, the public, and the environment.

**105-N Reactor Building.** The 105-N is a 4,000-megawatt (thermal) nuclear reactor designed to operate as a dual-purpose reactor. The reactor core is a graphite-moderated, light water-cooled, horizontal pressure-tube facility designed to produce plutonium. By-product steam was routed to a nearby privately operated facility (185-N Hanford Generating Plant [HGP]) to produce approximately 860 megawatts of electricity. Construction of N Reactor began in December 1959 and was completed in October 1963. N Reactor was the last of the Hanford Site graphite-moderated reactors. The facility contains the reactor block, front and rear elevators, pipe galleries, exhaust fans, a receiving basin for spent fuels, offices, control rooms, electrical and instrument rooms, a shop area, ventilation supply, metal preparation and storage areas, fuel storage basin, and a transfer area. On the south side of the building is the 109-N Heat Exchanger Building, which shares a common wall with 105-N.

The footprint of the 105-N facility is approximately 7,939 $m^2$ (85,450 $ft^2$) and includes three below-grade floor areas (minus 10-foot level, minus 16-foot level, and minus 21-foot level), main floor area (0-foot level), and four above-grade floor areas (plus 15 foot level, plus 28-foot level, plus 40-foot level, and plus 60-foot level). The roof is at the plus 70-foot level and also includes a penthouse structure that extends to 24 meters (m) (80 ft) above grade. The reactor core and other primary reactor support areas are constructed of reinforced concrete and mass shield walls. Interior walls are composed of steel frame, concrete block (concrete masonry unit), and insulated panel construction. The exterior of the building is covered with insulated corrugated-metal wall panels. The roof is covered with built-up roofing with felt strips near the edges and over-covered with urethane foam and two sealer coatings.

The reactor core is composed of interlocking graphite bars containing zirconium-alloy pressure tubes, which held the zirconium alloy-clad uranium-metal fuel elements. Reactivity and reactor power levels were controlled using horizontal control rods and a vertical ball-drop system. Boron was the primary neutron-absorbing material used in the control rods and ball-drop system.

Deactivation of the 105-N facility was completed in 1998, which included shutdown and isolation of operational systems, cleanup of radiological and hazardous waste, inventory

of remaining hazardous materials, sealing access areas, and securing the facility. Contaminated hardware and equipment, sludge, and water were removed from the fuel storage basin. Concrete cover blocks were placed over the fuel storage basin to provide shielding and isolation. Although the deactivation has been completed, portions of the building remain as high-radiation areas and airborne radiation areas. In addition, lubricating oils and/or hydraulic fluids remain in some pieces of equipment.

**109-N Heat Exchanger Building.** Construction of the 109-N Building began in December 1959 and was completed in October 1963. The 109-N and 105-N facilities share a common wall. The 109-N Building is being considered with the 105-N ISS due to structural integrity concerns over separating the two facilities and because of the high levels of radionuclide contamination within the piping systems and steam generator cells in the 109-N Heat Exchanger Building. Reactor primary coolant from 105-N was circulated through the reactor to steam generators located in the 109-N Heat Exchanger Building and then routed back to the reactor via primary coolant pumps. Steam from the steam generators was routed through a closed loop secondary system and was either dumped into water-cooled dump condensers or piped to the HGP to generate electricity. Circulation of the highly radioactive reactor primary coolant through 109-N caused equipment, piping, and steam generators to be contaminated similar to levels within the 105-N Reactor equipment and piping. Tube leaks in the 109-N Heat Exchanger Building's steam generators allowed radiologically contaminated primary water to be carried to the HGP's secondary systems. The HGP (185-N) along with a portion of the 1802-N pipe trestle that leads to the 185-N Building were demolished in 2003.

The 109-N facility is located on the south side of the 105-N Reactor immediately next to the building. The footprint of the building is approximately 8,406 $m^2$ (90,480 $ft^2$) and includes a below-grade floor area (minus 16-foot level), main floor area (0-foot level), and two above-grade floor areas (plus 15-foot level and plus 24-foot level). The roof is at the plus 38-foot level and also includes a penthouse structure that extends to 24 m (80 ft) above grade. The penthouse structure is shared between the 105-N and 109-N facilities. The facility contains an auxiliary cell and six steam generator cells in parallel, each cell containing two steam generators, a drive turbine, a circulating pump and associated piping, valves, and instrumentation. Each steam generator is 17 m (57 ft) long by 3 m (10 ft) in diameter and weighs approximately 154 metric tons (170 tons). The 109-N Building includes a decontamination cell and a central penthouse area that contains a 13.5 m (44.5-ft) high by 2 m (6.5-ft) diameter pressure vessel weighing approximately 82 metric tons (90 tons). The building is constructed of reinforced concrete with metal siding on the exterior and polyurethane roofing material over a 10 cm (4-in.) concrete slab. Interior walls are concrete block. The reinforced-concrete walls around the steam generator cells are approximately 1.5 m (5 ft) thick. The exterior of the building has eleven 1.8 m (6-ft) diameter roof vents and the steam distribution headers and piping that routed pressurized steam to the 185-N HGP via the 1802-N pipe trestle.

Deactivation of the facility was completed in 1998, which included shutdown and isolation of operational systems, cleanup of radiological and hazardous waste, inventory

of remaining hazardous materials, sealing access areas, and securing the facility. Although deactivation was completed, portions of the building (e.g., steam generator cells) remain as high-radiation areas and airborne radiation areas. The 109-N facility contains a large amount of asbestos and asbestos-containing materials that were primarily used for thermal insulation. In addition, lubricating oils and/or hydraulic fluids remain in some pieces of equipment.

The contaminants of concern potentially found in the 105-N and 109-N facilities include the following materials:

- Radionuclides, including Tritium (H-3), Carbon-14, Cobalt-60, Nickel-59, Nickel-63, Strontium-90, Technetium-99, Cesium-137, Europium-152, Europium-154, Plutonium isotopes, and Americium-241.
- Non-radioactive hazardous substances, including friable and nonfriable forms of asbestos, lead paint, lead shielding, polychlorinated biphenyls (PCBs) (e.g., light ballasts), mercury (in switches, gauges, and thermometers), refrigerants (freon), petroleum products, water treatment products, lubricants, corrosives, high-efficiency particulate air filter media, and sodium-vapor and mercury-vapor lighting.

USDOE is the lead agency for conducting this removal action, and the Washington State Department of Ecology (Ecology) is the lead regulatory agency per the Tri-Party Agreement. USDOE and Ecology have determined that a non-time critical removal is appropriate for the removal of the risk associated with the 105-N and 109-N facilities. This decision is consistent with the Hanford Federal Facility Agreement and Compliance Order (HFFACO) Milestone M-93-20, which requires that USDOE complete the 105-N Reactor ISS no later than September 30, 2012.

## III. Threat to Public Health, Welfare, or Environment

The 105-N and 109-N facilities are contaminated with hazardous substances, primarily radionuclides. The source, nature, and extent of contamination within the 105-N and 109-N facilities are related to the specific operations conducted at each facility. In general, contamination in the 105-N Reactor Building resulted from activities associated with operation of a closed-loop, graphite-moderated, water-cooled reactor used to produce weapons-grade plutonium and steam for electric power generation. Activities conducted at the 105-N facility included storage and handling of green reactor fuel; general maintenance of the reactor systems; handling, storage, and shipping of irradiated reactor fuel; and collection and discharge of solid and liquid waste materials. These activities generated a variety of radioactive, nonradioactive hazardous, and mixed wastes in the 105-N Reactor Building. In addition, some other forms of hazardous material contamination (e.g., asbestos, lead shielding) are related to the structural components of the facility.

Contamination in the 109-N Heat Exchanger Building resulted from activities associated with the generation and transmission of steam to the HGP to generate electricity.

Activities conducted at the 109-N facility included circulation of N Reactor primary coolant, operation of steam generators and dump condensers, discharge of steam to the HGP, equipment decontamination, and collection and discharge of solid and liquid waste streams. These activities generated a variety of radioactive, nonradioactive hazardous, and mixed wastes in the 109-N Heat Exchanger Building. In addition, some forms of contamination (e.g., asbestos, lead shielding) are related to the structural components of the facility

A potential threat to public health or welfare and the environment exists through the deterioration of the facility or its catastrophic collapse. Either of these scenarios could result in a release of hazardous substances to the air or soil.

## IV. Endangerment Determination

The response action proposed is necessary to protect the public health or welfare, or the environment from the actual or threatened releases of hazardous substances, including radioactive substances from this site into the environment.

## V. Proposed Action and Estimated Costs

USDOE prepared an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate alternatives considered for the removal action of the 105-N and 109-N facilities. The three alternatives considered are described below.

### 1.0 No Action

Under the no action alternative, 105-N and 109-N facility ISS activities would not be performed and current S&M activities would be discontinued. No other specific controls would be established for the 105-N facilities. Because the facilities would not be decontaminated, and no action would be taken to stop the facilities from deteriorating, there would be an increased threat and likelihood for a release of hazardous substances, potentially exposing workers, the public, or the environment.

There is no cost associated with the no action alternative.

### 2.0 Interim Safe Storage of the N Reactor Complex

Alternative two would consist of performing ISS of the 105-N Reactor Building and the 109-N Heat Exchanger Building. Limited S&M of the 105-N and 109-N safe storage enclosures (SSEs) would follow ISS activities. D&D of the remaining portions of 109-N (piping gallery and steam generator cells) would be performed after the long-term S&M period, in approximately 64 years.

ISS of 105-N and 109-N would consist of performing decontamination and decommissioning (D&D) of portions of the facilities and construction of an SSE over the

105-N Reactor block and the 109-N steam generator cells and pipe gallery. The 109-N facility would be subjected to ISS along with the 105-N facility because contact with the primary reactor coolant within the 109-N piping systems and steam generator cells resulted in high levels of radionuclide contamination in the 109-N facility, and due to concerns over the structural integrity of separating the two facilities. ISS would prevent advanced structural deterioration and potential release of radionuclides or other hazardous substances.

The first stages of this alternative would consist of assessment, decontamination, and demolition of portions of the 105-N and 109-N facilities. All portions of the 105-N facility outside of the reactor shield walls would undergo D&D. This includes all of the rooms and shops from the minus 16-foot elevation to the plus 28-foot elevation and the entire plus 40-foot and plus 60-foot elevation areas. This would also include the 105-N Fuel Storage Basin and load out facilities. Removal of the storage basins would result in a significant reduction of radiological contamination in the facility. Contaminated below-grade structures and underlying soil would be removed and disposed, as needed. Uncontaminated below-grade structures may be stabilized in place.

For the 109-N facility, all portions of the 109-N facility outside of the shield walls encompassing the steam generator cells and pipe gallery would undergo D&D. This includes all of the rooms and shops from the minus 16-foot elevation to the plus 24-foot elevation areas, as well as the external steam distribution piping and subgrade cooling water distribution piping directly south of the facility. This would also include D&D of the decontamination cell, pressurizer tank system, and the penthouse structure surrounding the pressurizer tank. Contaminated below-grade structures and underlying soil would be removed and disposed, as needed. Uncontaminated below-grade structures may be stabilized in place.

The SSE structures will be designed and built to completely enclose the roof sections of the 105-N and 109-N facilities. The SSE will consist of a self-supporting, structural-steel frame covered with metal roofing. All openings and penetrations within the shield walls and on top of the reactor would be closed. Large openings would be sealed by concrete pourbacks; and welded caps, foam sealant, or plugs would close smaller openings and penetrations.

For the 109-N facility, the existing steam generator/pipe gallery shield walls and roof, constructed of 1.5 m (5-ft) thick reinforced concrete, would be used as the primary enclosure for safe storage. After D&D of the 109-N facility turbine drive bay, steam and cooling water distribution piping, decontamination cell, and pressurizer penthouse areas, a new metal roof would be constructed to enclose the top of the remaining structure. The roof would consist of structural steel and metal roof decking designed to meet the ISS storage period of 64 years (the roof has a 75-year design life). The steam generator/pipe gallery walls would support the roof. Openings between the new roof and top of the steam generator/pipe gallery walls would be enclosed with wall panel siding similar to that on the new roof. Openings and penetrations within the steam generator/pipe gallery

walls would be closed. Large openings would be sealed by concrete pourbacks; and welded caps, foam sealant, or plugs would close smaller openings and penetrations.

The estimated present-worth costs[2] associated with alternative two are $71.1 million, which includes ISS of the 105-N Reactor Building, ISS of the 109-N Heat Exchanger Building, and D&D of the 109 N steam generator cells and pipe gallery in approximately 64 years.

## 3.0 Surveillance and Maintenance (S&M) of the 105-N and 109-N Facilities

Alternative three would consist of S&M of the 105-N and 109-N facilities to maintain minimum safe conditions until final disposition of the 105-N facility is determined. D&D of the 109-N facility will be performed prior to initiating final disposition of the 105-N facility (in approximately 64 years). Alternative three also includes activities to perform D&D of the 105-N facility up to the reactor shield walls. S&M would be assumed to occur until final disposition of the 105-N Reactor block, which is within approximately 64 years.

During the S&M phase of this alternative, existing institutional controls would be maintained to warn area workers of potential hazards and restrict public access to the N Reactor complex. Access to the 105-N and 109-N facilities would be restricted for nonradiological workers. The S&M measures would include routine radiological and hazard monitoring of the facilities, periodic safety inspections, and basic facility maintenance (as required) based on the condition of each specific facility. Activities would be balanced to reduce worker hazards and the potential for contaminant release. Major repairs (e.g., repair/replace roof, shore structural components) would be performed as necessary to ensure facility integrity for containment of hazardous substances within the structure.

The entire 109-N facility would undergo assessment and decontamination and demolition prior to initiating final disposition of the 105-N facility (approximately 2068). All portions of the 109-N facility, including the steam generator cells, pipe gallery, decontamination cell, and pressurizer tank system, would undergo D&D up to the common reactor shield wall that separates the 105-N facility from the 109-N facility. This includes all of the rooms and shops from the minus 16-foot elevation to the plus 24-foot elevation areas as well as the external steam distribution piping and subgrade cooling water distribution piping directly south of the facility. Contaminated below-grade structures and underlying soil would be removed and disposed, as needed. Uncontaminated below-grade structures may be stabilized in place. The area would be backfilled to its original grade to minimize infiltration of precipitation. All portions of the 105-N facility outside of the reactor shield walls would undergo D&D. This includes

[2] The estimated costs in the EE/CA were inadvertently reported as present-worth costs. The present-worth cost for Alternative 2 was calculated at a 7-year real interest rate of 2.4% for 8 years. The total non-discounted cost for Alternative 2 is $77.1 million.

all of the rooms and shops from the minus 16-foot elevation to the plus 28-foot elevation and the entire plus 40-foot and plus 60-foot elevation areas. This would also include the 105-N Fuel Storage Basin and load out facilities. Contaminated below-grade structures and underlying soil would be removed and disposed as needed. Uncontaminated below-grade structures may be stabilized in place.

The estimated present-worth costs[3] associated with alternative three are $22.4 million, which includes long-term S&M of the 105-N, roof repair and replacements, D&D of the 105-N reactor building in approximately 64 years, and D&D of the 109-N heat exchanger buildings in approximately 64 years.

## VI. Selected Alternative

USDOE and Ecology have selected Alternative two - ISS of the 105-N and 109-N Buildings – for the removal action at the 105-N facility. 40 Code of Federal Regulations (CFR) 300.5 defines removal as "the ... taking of such actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare of the U.S. or to the environment, which may otherwise result from a release or threat of release. The term includes...security fences or the measures to limit access." The Interim Safe Storage of 105-N Reactor Facility and 109-N Heat Exchanger Building as described in the Action Memorandum meets this definition since the cocooning will limit access to contaminants and prevent, minimize, or mitigate the potential hazards associated with the facilities for the 64 year interim period. This alternative was selected based on its overall ability to provide protection of human health and the environment and its effectiveness in maintaining protection for both the short-term and long-term. Implementation of alternative two facilitates a final disposition decision on the N Reactor by removing much of the potentially contaminated materials, protecting the remaining contaminated structures, and allowing decay of remaining radioactive contamination until final disposition is accomplished. Alternative two would involve assessment, partial D&D of the 105-N and 109-N facilities, ISS of the remaining facilities, construction of SSE structures over 105-N and 109-N, waste disposal, and long-term S&M of the SSE structure, followed by D&D of the remaining portions of 109-N. The Environmental Restoration Disposal Facility (ERDF) would primarily be used for waste disposal, which provides an engineered disposal facility that is protective of the environment. Any offsite waste disposal would require a determination by the United States Environmental Protection Agency (EPA), with Ecology notification. Contaminants remaining in the 105-N Reactor block and in the 109-N steam generator cells and pipe gallery enclosed in the SSE, would be substantially isolated and would allow for a significantly reduced S&M program until final disposition of these buildings can be achieved.

[3] The estimated costs in the EE/CA were inadvertently reported as present-worth costs. The present-worth cost for Alternative 3 was calculated at a 30-year real interest rate of 3.5% for 64 years. The total non-discounted cost for Alternative 3 is $101.8 million.

## VII. Applicable or Relevant and Appropriate Requirements

The EE/CA considered the applicable or relevant and appropriate requirements (ARARs) for the various alternatives evaluated for this removal action. Attachment 1 identifies the ARARs that will be applied for the selected removal alternative.

## VIII. Outstanding Policy Issues

There are no policy issues associated with this removal action.

## IX. Schedule

HFFACO milestone M-93-20 requires that USDOE complete the 105-N Reactor ISS no later than September 30, 2012. USDOE has established a schedule in the EE/CA that will accomplish the activities to complete ISS by this due date. USDOE shall submit a sampling and analysis plan (SAP) to Ecology and EPA for approval during the ISS activities. USDOE shall submit a Removal Action Work Plan to Ecology for approval prior to initiation of ISS activities.

## Attachment 1 – ARARs for the 105-N Facility Removal Action

### Waste Management Standards

The State of Washington Hazardous Waste Management Act (HWMA), as implemented by "Dangerous Waste Regulations" (Washington Administrative Code [WAC] 173-303) regulates the management of dangerous wastes that may be generated under this removal action. The regulations require identifying and appropriately managing dangerous wastes and dangerous waste components of mixed wastes, as well as identifying associated treatment and disposal standards. Land disposal restrictions (LDRs) established under the Resource Conservation and Recovery Act (RCRA) (40 CFR 268) prohibit disposal of restricted wastes unless specific concentration-or technology-based treatment standards have been met. Washington State LDRs are established under WAC 173-303-140. The LDRs would be applicable to the treatment and disposal of dangerous or mixed wastes that may be generated during the removal action.

The *Toxic Substances Control Act of 1976* (TSCA), as implemented by "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" (40 CFR 761), regulates the management and disposal of PCBs and PCB waste. The ERDF is authorized to accept nonliquid PCB wastes for disposal. All PCB waste that meets the waste acceptance criteria would be disposed of at the ERDF. Any PCB waste that does not meet ERDF waste acceptance criteria would be staged within the area of contamination or sent to an onsite PCB storage area that meets the substantive requirements of 40 CFR 761.65 and subsequently transported offsite to a TSCA-approved waste disposal facility. Offsite disposal would require an offsite acceptability determination in accordance with 40 CFR 300.440 from EPA, with notification to Ecology.

Radioactive wastes are governed under the authority of the *Atomic Energy Act of 1954*. Waste designated as low level waste (LLW) that meets ERDF waste acceptance criteria (BHI 2002) would be disposed at the ERDF, which is engineered to meet appropriate performance standards under 10 CFR 61. If transuranic (TRU) waste is encountered, it would be placed in interim storage at the Waste Receiving and Processing Facility, Module 1 (WRAP) or the Central Waste Comples (CWC) and shipped offsite to the Waste Isolation Pilot Plan (WIPP) in accordance with the WIPP waste acceptance criteria and the schedule established for completing remedial actions no later than September 30, 2024.

The removal of asbestos and asbestos-containing material (ACM) is regulated under the *Clean Air Act of 1955* as implemented by "National Emissions Standards for Hazardous Air Pollutants" (40 CFR 61, Subpart M). These regulations provide standards to ensure that emissions from asbestos are minimized during collection, processing, packaging, and transportation.

## Transportation

The *Hazardous Materials Transportation Act of 1974*, as implemented by "Requirements for the Transportation of Hazardous Materials" (49 CFR 100 through 49 CRF 179), governs the transportation of potentially hazardous materials (including samples and waste) on public roads. This regulation is applicable to any wastes or contaminated samples that would be shipped off the Hanford Site.

## Disposal

After treatment, as appropriate, dangerous and mixed waste that meets the requirements of the *Environmental Restoration Disposal Facility Waste Acceptance Criteria* would be disposed of at the ERDF, which is authorized to receive such waste. Of the Hanford disposal options, only the ERDF is considered to be "onsite" for management and/or disposal of waste from removal actions proposed in this document[4]. It is expected that the great majority of the waste generated during the removal action proposed in this document can be disposed onsite at the ERDF. For waste that must be sent offsite, the EPA would make a determination in accordance with 40 CFR 300.440 as to the acceptability of the proposed site for receiving this Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action waste. Treatment residuals from an offsite facility can be disposed in ERDF providing that the treatment residuals meet the ERDF waste acceptance criteria. .

## Standards Controlling Releases to the Environment

The federal *Clean Air Act* and the "Washington Clean Air Act" (*Revised Code of Washington* [RCW] Chapter 70.94) regulate both criteria/toxic and radioactive airborne

[4] CERCLA Section 104(d)(4) states that, where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the President may, at his discretion, treat these facilities as one for the purpose of this section. The preamble of the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) clarifies the stated EPA interpretation that when noncontiguous facilities are reasonably close to one another, and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Therefore, the 300 Area NPL site and the ERDF are considered to be onsite for response purposes under this removal action. It should be noted that the scope of work covered in this removal action is for facilities and waste contaminated with hazardous substances. The DOE will disposition materials encountered during implementation of the selected removal action that are not contaminated with hazardous substances under non-CERCLA authority. Materials with no hazardous substance contamination are not eligible for disposal in the ERDF.

emissions. Under implementing regulations found in 40 CFR 61, Subpart H, and WAC 246-247-040(3) and WAC 246-247-040(4), radionuclide airborne emissions from all combined operations on the Hanford Site may not exceed 10 mrem/yr effective dose equivalent to the hypothetical maximally exposed individual at the nearest unrestricted area where any member of the public may be. WAC 173-480-070 requires verification of compliance and the use of best available radionuclide control technology or as low as reasonably achievable control technology.

WAC 173-400 and 173-460 establish requirements for emissions of criteria/toxic air pollutants. The primary source of emissions would be fugitive particulate matter. WAC 173-400-040 identifies general standards for control of fugitive emissions resulting from materials handling, construction, demolition, or other operations. WAC 173-460 would be relevant and appropriate to removal actions that require the use of a treatment technology that emits toxic air pollutants.

## Cultural, Historical, and Ecological Resource Protection Requirements

The *Archeological and Historic Preservation Act of 1974* provides for the preservation of historical and archeological data (including artifacts) that might be irreparably lost or destroyed as the result of a proposed action. Although the removal action will occur in previously disturbed areas and the discovery of artifacts is unlikely, this law would be applicable to any significant artifacts that may be discovered.

The *Native American Graves Protection and Repatriation Act of 1990* (i.e., as regulated by 43 CFR 10) requires agencies to consult and notify culturally affiliated tribes when Native American human remains are inadvertently discovered during project activities. It is unlikely that work proposed in this removal action would inadvertently uncover human remains. If human remains were encountered, the procedures documented in the *Hanford Cultural Resources Management Plan* (DOE-RL 2003) would be followed.

The *National Historic Preservation Act of 1966* (i.e., as regulated by 36 CFR 800) requires federal agencies to evaluate historic properties for eligibility in the National Register of Historic Places (NPS 1988) and to mitigate adverse effects of federal activities on any site eligible for listing in the National Register. The facilities included in the scope of this removal action will be inspected to identify artifacts that may have interpretive or educational value prior to performing interim safe storage.

The *Endangered Species Act of 1973*, which is implemented by 50 CFR 402, requires the conservation of critical habitat on which endangered or threatened species depend, and prohibits activities that threaten the continued existence of listed species or destruction of critical habitat. The *Historic Migratory Bird Treaty Act of 1918* makes it illegal to remove, capture, or kill any migratory bird or any part of nests or the eggs of any such birds. Although adverse impacts to endangered or threatened species or migratory birds are not expected, activity specific ecological reviews will be conducted to identify any potentially adverse impacts prior to beginning field work.

## Attachment 2 - Comments on the Engineering Evaluation/Cost Analysis for the 105-N Reactor Facility and the 109-N Heat Exchanger Building

**Leslie Davenport (LD)**

1. **Comment (LD):** *I support the choice of the recommended alternative two (ISS of the N Reactor Complex) in Section 6.0 of the Engineering Evaluation/Cost Analysis for the 105-N Reactor Facility and the 109-N Heat Exchanger Building, DOE/RL-2004-46, Rev. 0, September 2004. The use of ERDF, a lined waste disposal facility that can accept CERCLA and specific RCRA waste generated anywhere on the Hanford Site, is very important to me. Also, do the ISS work now. Do not delay removal until after years of expensive S&M and costs have escalated, and ERDF will most likely be closed.*

   **Response:** Thank you for your comments. The ERDF is the preferred alternative for waste disposal from this activity. It is expected that all waste (with the exception of waste that does not meet the acceptance criteria of the ERDF) will go to the ERDF. Initial pre-demolition work for the ISS of the 105-N Reactor Facility and the 109-N Heat Exchanger Building has already started and will be completed on or before the M-93-20 TPA Milestone date of September 30, 2012.

**Richard I. Smith**

1. **Comment (RS):** *This report neither contains nor provides references for much of the kind of detailed information needed to develop confidence in the results. There is little or no discussion of the postulated activities to be performed, or of the methodologies used to develop the estimated costs and durations associated with these activities. There are no estimates developed and presented of the expected costs for waste disposal.*

   **Response:** The rough-order-of-magnitude costs included in the EE/CA were developed using computer models based on the updated Micro Computer-Aided Cost Engineering System (MCASES) models established by U.S. Army Corps of Engineers. Inputs to the cost estimating models were based on actual costs incurred performing interim safe storage of other Hanford reactor facilities (105-C, 105-DR, 105-F) and information obtained during facility walkdowns and review of drawings. The specific level of detail you mention has not been included or required for this type of document in the past. Costs for waste disposal are included in the Other Direct Costs (ODC) category. ISS has been selected and recommended as the preferred alternative for all reactors (with the exception of the B Reactor) that have undergone a removal action to put the reactor in a state of reduced S&M.

2. **Comment (RS):** *The estimated costs presented in Tables 4-1 and 4-2 are essentially unsupported by analyses in the report. I would have expected either a more explicit detailed development of those estimates in an appendix or in a referenced report that is available for review. The items/activities collected as Other Direct Costs should be broken out for display.*

   **Response:** The estimated costs are based on the actual costs for performing interim safe storage at five of Hanford's surplus reactors over the past 7 years and information obtained during facility walkdowns and review of drawings. The level of detail included in the report is identical to the cost estimates included in other similar reports for interim safe storage of the earlier reactors.

3. **Comment (RS):** *I am confused by what is called 'Present-Worth Analysis' in this report. Is Present-Worth the same thing as Present-Value Analysis? If present-worth = present-value, then the results reported here which are labeled as Present-Worth costs are incorrect, having neglected the effects of escalating and discounting future expenditures over the long ISS period. Also, the net discount rate (interest rate – escalation rate) assumed for a present-worth calculation over the extended ISS period is not presented. In fact, all of the results of cost analyses presented herein are given in dollars of the current year, despite the fact that many of the expenditures occur over a long (~ 64 years) time period. Thus, all of the costs should be labeled as current-year dollars, not present-worth dollars. If it is necessary to include present-worth cost estimates in the report, they should appear in a separate column or line in the cost tables, properly labeled. Perhaps a short discussion of what is meant by Present-Worth Analysis should be inserted into the executive summary, for clarity. My personal opinion is that the costs in this report should be given in current-year dollars, but the current cost of future expenditures should be escalated to the years in which they take place, to give a more realistic estimate of the total cost of the program.*

   **Response:** Comment noted. The estimated costs in the report were inadvertently reported as present-worth costs. These costs are current-year costs based on 2004 dollars and should have been reported as such. For alternative 2, the estimated current-year cost is $77.1 million. The present-worth cost for alternative 2 is $71.1 million calculated at a 7-year real interest rate of 2.4% for a duration of 8 years. For Alternative 3, the estimated current-year cost is $101.8 million. The present-worth cost for alternative 3 is $22.4 million calculated at a 30-year real interest rate of 3.5% for a duration of 64 years.

4. **Comment (RS):** *The report does not explicitly say that the cost estimates presented <u>exclude</u> the costs associated with the final disposition activities for the reactor block portion of the facility until Page 5-7, Section 5.3. It would be well to make that exclusion obvious in the executive summary and in Sections 4.3.6 and 4.4.5, and in their tables, Table 4-1 and 4-2.*

**Response:** Although the report does not explicitly exclude the costs associated with final disposition of the reactor block, the report consistently describes that the alternatives being evaluated for the 105-N Reactor are only for interim storage. Additionally, the report frequently describes that a final disposition decision for the 105-N Reactor has not been made.

5. **Comment (RS):** *There is some confusion about the length of the ISS period. The executive summary says 75 years, the report text uses 64 years throughout, and the schedule as presented in Section 7 implies about 58 years, assuming final disposition begins in 2068. The duration of this period affects the total cost estimates, so these discrepancies should be eliminated.*

   **Response:** Comment noted. The 75-year safe storage period described in the Executive Summary is consistent with the current anticipated time frame for decommissioning of the eight other surplus Hanford reactors, which is expected to be complete by 2068. Upon completion of construction of the safe storage enclosure, which is currently scheduled to be completed on the M-93-20 Tri-Party Agreement (TPA) Milestone date of September 30, 2012, 56 years of the safe storage period will remain.

6. **Comment (RS):** *Schedules should be shown for both alternatives, illustrating the time duration for the preparations for ISS, the duration of the inactive ISS, and for the D&D activities at the end of the ISS period for Alternative 2, and illustrating the time duration for the preparation for long-term S&M, the duration of the S&M period, and duration of the D&D activities at the end of the S&M period for Alternative 3.*

   **Response:** Figure 7-1 displays the schedule duration for performing ISS. Interim safe storage is expected to continue until 2068. Under Alternative 3, the 105-N and 109-N facilities have already been deactivated. As described in the EE/CA, the S&M period will continue until actions on the final disposition of 105-N begin.

7. **Comment (RS):** *Executive Summary, Page ES-1, 1st ¶, line 5: Is the length of the ISS period 75 or 64 years, or 58 years? line 10: insert the words 'preparation for' following 'After'.*

   **Response:** See response to comment #5.

8. **Comment (RS):** *Page ES-2, 2nd bullet, line 1: delete the words 'performed or is in progress at' and replace them with 'previously selected for the'.*

   **Response:** Comment noted.

9. **Comment (RS):** *Last, This would be a good place to insert the discussion of exactly what is meant by "present-worth analyses", to avoid the confusion discussed above.*

**Response:** Comment noted. Further clarification of the present-worth costs will be provided in the Action Memorandum.

10. **Comment (RS):** *Page ES-3, Table ES-1: Change the heading "Present-Worth Cost" to "Cost in Current-Year Dollars". Add a footnote that tells the reader that the costs for final disposition of the reactor block are not included in the costs given in the table.*

    **Response:** See response to comment #3 and #4.

11. **Comment (RS):** *Page 2-1, last, line 6: The term 'conservation (mining)' seems like an oxymoron. Mining rarely has anything to do with conservation.*

    **Response:** Conservation "mining" is a term used in the Hanford Comprehensive Land-Use Plan Environmental Impact Statement (DOE/EIS-0222-F), and is defined as " . . . an area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining could occur as a special use (e.g., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation . . ."

12. **Comment (RS):** *Page 4-5, 1st , line 3: Typo, Side panels <u>avot</u> the shield walls ..*

    **Response:** The sentence should read "Side panels *above* the shield walls."

13. **Comment (RS):** *Page 4-13, Figure 4-3: Some labeling of the various parts of the facility would be useful to the reader. Is the shaded area that portion which is included within the ISS boundary? The reactor block should be identified.*

    **Response:** The key indicating the SSE should be shaded.

14. **Comment (RS):** *Page 4-15, 4-16, Tables 4-1 and 4-2: Add footnotes that explicitly say that the costs for final disposition of the reactor block are not included in the presented costs.*

    **Response:** See response to comment #4.

15. **Comment (RS):** *Table 4-2: Remove 'Present-Worth' from the title.*

    **Response:** Comment noted.

**Oregon Department of Energy**

1. **Comment (ODOE):** *We support moving forward with the decontamination and demolition of the bulk of the 100-N area facilities. We agree that excessive radiation dose to workers from the high levels of cobalt-60 is a good reason to delay the difficult work of dismantling the reactor core for 75 years to allow the cobalt to decay. The cocooned 105-N reactor will then need to be dismantled and clean up completed. This proposal was previously considered in a separate environmental impact statement (EIS) on decommissioning of the eight single pass reactors. It seems logical and appropriate to include the N-Reactor in that decision, though revisions to the EIS and record of decision may be needed.*

   **Response:** Agreed. Regulatory paths for making a final disposition decision for the N-Reactor are still being evaluated.

2. **Comment (ODOE):** *We are not persuaded that the same reasoning applies to the 109-N steam facility. The EE/CA presents no information about the levels of contamination present in the 109-N steam facility, or an assessment of the risks to workers now and in the future. Radioactive primary coolant was routed to steam generators in 109-N and did transfer some radioactive material to these systems. Delay in removing the steam generators and associated equipment would allow for decay of short lived isotopes of cobalt or europium. The EE/CA should evaluate levels of cobalt, europium and other radioactive elements that may be found in the steam generators and associated piping and valves.*

   **Response:** The primary coolant system shared by the 105-N Reactor Facility and the 109-N Heat Exchanger Building currently contain an estimated inventory of 44 Curies of cobalt-60 and small amounts of other radionuclides. Dose rates in the 109-N pipe gallery and heat exchanger cells currently range from 1 to 2 Rem/hour. Cobalt-60 is the major contributor to these dose rates.

3. **Comment (ODOE):** *Delay in dismantling 109-N is only justified if such delay makes a major difference in the worker radiation dose. The EE/CA does not currently provide detailed information to support this argument. Failing a strong case for delay based on the reactor cocooning decision, this equipment and structure should be removed now. It is inappropriate to use a non-time critical removal action to independently make a decision not to remove wastes.*

   **Response:** Allowing the radioactive inventory to decay will eliminate dose to workers and allow the D&D work to be done by workers in contact with the equipment and materials.

4. **Comment (ODOE):** *At a minimum, the planned actions should encompass complete removal of all secondary system equipment in 109-N, other than the steam generators and the primary piping. Also, a full assessment of hazardous waste should be*

*performed. Large deposits of elemental copper are not uncommon in systems of similar design from corrosion of Monel alloys used in the condensers by trace orthosilic acid in the secondary coolant.*

**Response:** The ISS alternative includes removal of all secondary piping systems including the condensers. Hazardous materials will be assessed and sampled as needed during D&D. The portion of the 109-N facility that will be maintained in ISS is the primary system which includes the steam generators, primary coolant pumps, and primary coolant piping. The steam generators and primary coolant system have been dried as a part of deactivation.

5. **Comment (ODOE):** *In 75 years, the Environmental Restoration Disposal Facility and the Integrated Disposal Facility will be closed and capped. Any waste remaining in the 100-N area will need to be disposed in a newly designed and built disposal facility. Design, construction, and operation costs for these facilities are significant and must be included in the comparative analysis.*

   **Response:** The ERDF closure date affects both alternative 2 and alternative 3. However, because alternative 3 defers a larger portion of cleanup to the "out years" than alternative 2 (the selected alternative) the costs associated with waste disposal under option 3 will likely be greater than option 2. The ERDF closure date adds further credence to the selection of alternative 2.

6. **Comment (ODOE):** *As part of this EE/CA, DOE should hypothesize what groundwater changes are expected as a result of the actions taken in the EE/CA. Monitoring should be performed to determine whether or not the hypothesis are correct, and to assess what impact these actions have had or will have on the groundwater pump and treat operations in the area and actions that may be needed in the near term to augment or restore these actions.*

   **Response:** Special precautions are taken during the removal action process to ensure the control of contaminants. Fixatives are applied to facilities and structures to ensure that contaminants are not released to the air or surrounding soil. When water is used to reduce the spread of contamination or fix contaminants in place, precautions are taken to ensure that no puddling, ponding, or runoff occurs; the Field Supervisor has the responsibility to monitor the use of water and fixatives to ensure that no puddling, ponding, or runoff occurs. At the end of removal action, soils are either stabilized and deferred to a later remedial activity, or they will be certified as meeting the cleanup requirements contained in the N-Area ROD(s). Groundwater monitoring is currently being performed in the 100-N Area.

7. **Comment (ODOE):** *An EE/CA is an inappropriate place to propose to make irretrievable and irreversible commitment of resource decisions, beyond the simple consumption of resources. Decisions about residual contamination and future land restrictions must be deferred to the full Remedial Investigation/ Feasibility*

*Assessment (RI/FS) and Record of Decision (ROD) process. EE/CA's do not contain sufficient analytical depth and do not have a sufficient public review process to substitute for the RI/FS process.*

**Response:** Comment noted. The documents produced in support of this removal action do not address the clean up levels of potential contaminants remaining in soils. Residual soil considerations and future land restrictions are addressed by the N-Area ROD(s).

Signature sheet for the Action Memorandum for the Interim Safe Storage of the 105-N Reactor Facility and 109-N Heat Exchanger Building between the State of Washington Department of Ecology and the United States Department of Energy.

Leif Erickson, Assistant Manager
for the River Corridor

3-10-05
Date

Signature sheet for the Action Memorandum for the Interim Safe Storage of the 105-N Reactor Facility and 109-N Heat Exchanger Building between the Washington State Department of Ecology and the United States Department of Energy.

Michael A. Wilson
Program Manager
Nuclear Waste Program

2/22/05
Date