DOE/ID-11340
Revision 0

U.S. Department of Energy
Idaho Operations Office

Action Memorandum for the Materials Test Reactor Facility End State and Vessel Disposal

August 2007

Idaho Cleanup Project

DOE/ID-11340
Revision 0
Project No. 23415

Action Memorandum for the Materials Test Reactor Facility End State and Vessel Disposal

August 2007

Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

Signature sheet for the Action Memorandum covering the MTR decommissioning activities at the U.S. Department of Energy's Idaho National Laboratory. This action is conducted by the U.S. Department of Energy with the concurrence of the U.S. Environmental Protection Agency and the Idaho Department of Environmental Quality.

Richard B. Provencher
Deputy Manager
U.S. Department of Energy Idaho Operations Office

Date 8/28/2007

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R Matthew Wells for

Nicholas Ceto
Idaho National Laboratory Program Manager
Region 10
U.S. Environmental Protection Agency

8/28/07

Date

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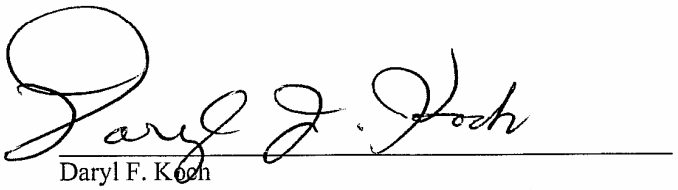

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ABSTRACT

This Action Memorandum documents the selected alternative for decommissioning of the Materials Test Reactor at the Idaho National Laboratory Site under the Idaho Cleanup Project. Since the missions of the Materials Test Reactor have been completed, an engineering evaluation/cost analysis that evaluated alternatives to accomplish the decommissioning of the Materials Test Reactor was prepared and released for public comment. The scope of this Action Memorandum is to encompass the final end state of the Materials Test Reactor building (TRA-603) and disposal of the Materials Test Reactor vessel. The selected removal action includes removing and disposing of the vessel at the Idaho CERCLA Disposal Facility and demolishing the reactor building to below ground surface.

EXECUTIVE SUMMARY

This Action Memorandum documents the selected alternative for decommissioning of the Materials Test Reactor (MTR) at the Idaho National Laboratory Site under the Idaho Cleanup Project. Preparation of this Action Memorandum has been performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the "Superfund Amendments and Reauthorization Act of 1986," and in accordance with the "National Oil and Hazardous Substances Pollution Contingency Plan." This action is consistent with the joint U.S. Department of Energy (DOE) and Environmental Protection Agency *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act*, which establishes the CERCLA non-time-critical removal action process as an approach for decommissioning. This approach satisfies environmental review requirements and provides for stakeholder involvement, while providing a framework for selecting the decommissioning alternative. An Administrative Record has been established to record information used to support the selected alternative as well as provide documentation of decisions and the progress of the removal action.

An engineering evaluation/cost analysis (EE/CA) that evaluated alternatives to accomplish the decommissioning of the MTR facility (TRA-603) and disposal of the MTR vessel was prepared and released for public comment. Comments received during the public comment period were considered for inclusion into this Action Memorandum and are included in Appendix A.

The scope of the EE/CA is the final end state of the MTR facility and disposal site for the MTR vessel. Three alternatives were evaluated in the EE/CA and Alternative 3, "Removal and Disposal of the MTR Vessel at an On-Site Disposal Facility," with disposal at the Idaho CERCLA Disposal Facility (ICDF) was the recommended and, ultimately, the selected alternative subsequent to Agency and public reviews. This alternative meets the remedial action objectives (RAOs) regarding long-term risk, minimizes short-term worker risk and radiation exposure, meets the DOE goal of reducing the "risk footprint" by consolidating wastes in the ICDF and reducing surveillance and maintenance cost on legacy buildings and structures, is cost effective, and provides a safe and stable configuration that is environmentally sound.

The MTR vessel meets the ICDF Waste Acceptance Criteria and would be transported and disposed of as low-level radioactive waste at the ICDF. Any remaining voids in the vessel would be filled with grout at the disposal site. The aboveground portions of the reactor building would be demolished to below ground surface and the resultant demolition material may be used as backfill or disposed of in accordance with the applicable disposal site Waste Acceptance Criteria. Materials left in place include inert material located below the ground surface, such as piping, equipment, electrical conduit, utility systems, structural steel, and other residual clean or contaminated materials, with low-level radioactive and/or chemically hazardous substances that do not present an unacceptable risk in accordance with the RAOs for *Final Record of Decision Test Reactor Area Operable Unit 2-13, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho* and *Explanation of Significant Differences to the Record of Decision for Test Reactor Area Operable Unit 2-13*. Excavations and remaining belowgrade structures would be grouted as necessary and/or backfilled as practical using inert demolition waste from abovegrade structures and uncontaminated clean backfill material, consisting of gravel and/or dirt. Clean backfill would cover the locations of MTR facility.

The selected alternative meets the RAOs regarding long-term risk, minimizes short-term worker risk and radiation exposure, is cost effective, and provides a safe and stable configuration that is environmentally sound. The end state provided by Alternative 3 is consistent with the DOE goal to minimize long term surveillance and maintenance costs by reducing the footprints and consolidating waste from contaminated facilities.

CONTENTS

FIGURES

TABLE

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
ATR	Advanced Test Reactor
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
COC	contaminant of concern
CRMP	Cultural Resource Management Plan
DEQ	(Idaho) Department of Environmental Quality
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
EE/CA	engineering evaluation/cost analysis
EPA	Environmental Protection Agency
ETR	Engineering Test Reactor
HAER	Historic American Engineering Record
HWMA	Hazardous Waste Management Act
ICDF	Idaho CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
MTR	Materials Test Reactor
NHPA	National Historic Preservation Act
NTCRA	non-time-critical removal action
OU	operable unit
PCB	polychlorinated biphenyl
RAO	remedial action objective/removal action objective
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RTC	Reactor Technology Complex
S&M	surveillance and maintenance
SRPA	Snake River Plain Aquifer

TRA	Test Reactor Area
TSCA	Toxic Substances Control Act
USC	United States Code
VCO	Voluntary Consent Order
WAC	Waste Acceptance Criteria

Action Memorandum for the Materials Test Reactor Facility End State and Vessel Disposal

1. PURPOSE

The purpose of this Action Memorandum is to document selection of the alternative for the removal action described herein for the Materials Test Reactor (MTR) facility and vessel disposal, Reactor Technology Complex (RTC), Idaho National Laboratory (INL), Idaho Falls and Butte County, Idaho.

2. SITE CONDITIONS AND BACKGROUND

This section provides summary background information and a description of the MTR facility. It identifies previous and ongoing closure and cleanup activities, including a description of the building and structures addressed in this Action Memorandum and additional information relevant to the scope of this document. This section also provides a summary of the radiological and nonradiological characterization of the MTR facility.

2.1 Site Description

The INL Site, managed by the Department of Energy (DOE), is located 51 km (32 mi) west of Idaho Falls, Idaho, and occupies 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain. In 1949, the U.S. Atomic Energy Commission established the INL Site, which was called the National Reactor Testing Station at that time, to conduct nuclear energy research and related activities. It was designated the Idaho National Engineering Laboratory in 1974 and then the Idaho National Engineering and Environmental Laboratory in 1997. In 2005, to better focus the laboratory's missions, DOE established the Idaho Cleanup Project to bring the environmental management mission to completion and redesignated the laboratory as the INL to better reflect the new research directions.

DOE's Idaho Operations Office (DOE-ID) controls all land within the INL Site. Public access is restricted to public highways, sponsored tours, special-use permits, and the Experimental Breeder Reactor I National Historic Landmark. In addition, DOE-ID is cognizant of the Shoshone-Bannock tribal members' need for access to areas on the INL Site for cultural and religious purposes.

2.1.1 Idaho National Laboratory Site and Idaho Cleanup Project

The INL Site is located primarily in Butte County; however, it also occupies portions of Bingham, Bonneville, Clark, and Jefferson counties. The 2000 census indicated the following populations for cities in the region: Idaho Falls–50,730; Pocatello–51,466; Blackfoot–10,419; Arco–1,026; and Atomic City–25. Approximately 2% of the INL Site has been developed to support facility and program operations. Up to 340,000 acres of the INL Site are leased for cattle and sheep grazing administered by the Bureau of Land Management. In 1999, the Secretary of Energy designated 73,263 acres on the INL Site as the Sagebrush Steppe Ecosystem Reserve to ensure this portion of the ecosystem received special scientifically controlled consideration.

Surface water flows on the INL Site consist mainly of three streams draining intermountain valleys to the north and northwest of the INL Site: (1) the Big Lost River, (2) the Little Lost River, and (3) Birch Creek. All of the channels terminate on the INL Site. Flows from Birch Creek and the Little Lost River seldom reach the INL Site because of irrigation withdrawals upstream. The Big Lost River and Birch

Creek may flow onto the INL Site before the irrigation season or during high-water years, but the terminal reaches are usually dry. In those few wetter years when the Big Lost River carries water to the end of its channel, the water sinks into the ground.

The physical characteristics, climate, flora and fauna, demography, and cultural resources of the INL Site and RTC area are further described in the Final Record of Decision for Test Reactor Area Operable Unit 2-13 (DOE-ID 1997).

2.1.2 Reactor Technology Complex Area

The RTC, shown in Figure 1, was established in the early 1950s with the development of the MTR, located in the TRA-603 building. Two other major reactors followed: the Engineering Test Reactor (ETR) and the Advanced Test Reactor (ATR).

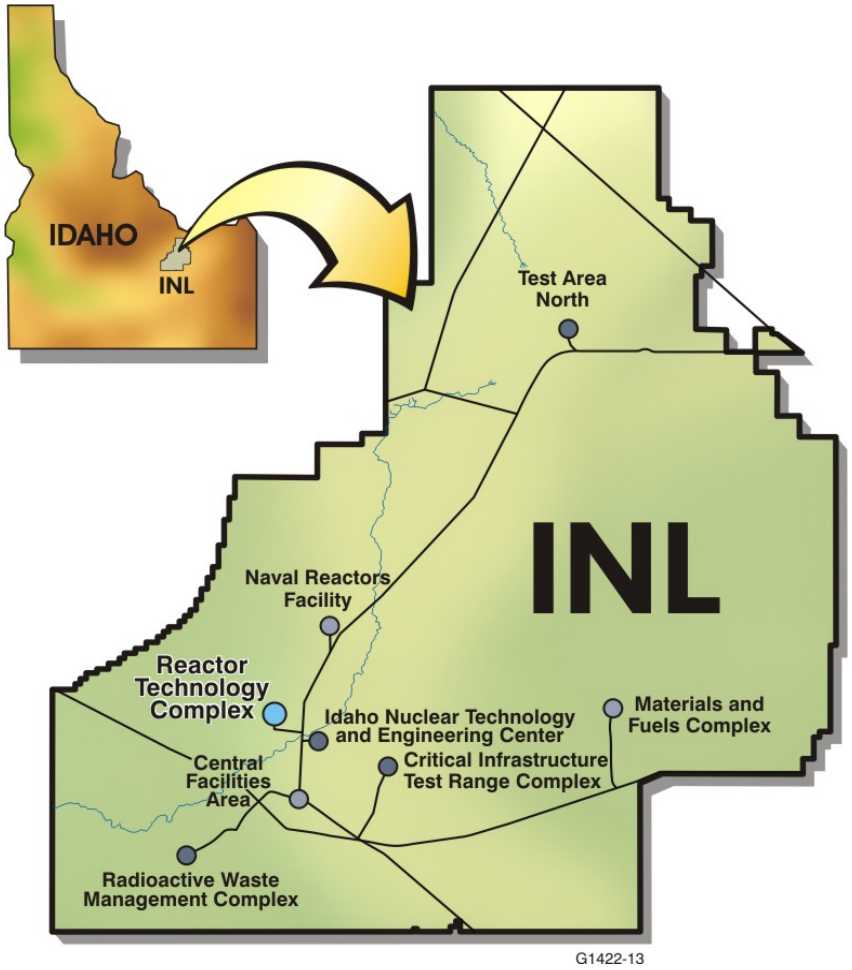

Figure 1. Map of the Idaho National Laboratory Site showing the location of the Reactor Technology Complex and other major facilities.

2.1.3 MTR Facility (TRA-603)

The MTR facility is a steel-framed facility with a main floor, a basement, and two abovegrade floors. The facility measures 130 × 131 ft and extends 58 ft above grade and 38 ft below grade. The reactor facility houses the multitank reactor vessel, along with the canal, subpile room, and the VH3

experiment cubicle in the basement. In addition, the second and third floors contained the control room, a room to house associated electrical equipment, and operation personnel offices**.**

2.1.3.1 Materials Test Reactor. The MTR operated as a high-flux, 40-MW (thermal) pressurized light water, heterogeneous enriched fuel, nuclear test reactor that achieved criticality in March 1952. The reactor vessel is comprised of five integral reactor tanks and one tank extension. As the name implies, the reactor was designed to allow testing of materials in high-intensity radiation fields. More than 15,000 different irradiation experiments were performed in MTR, which provided findings that were critical in the developing safe reactor operations and for testing components of future reactors. The MTR complex consists of several facilities and structures that occupy the south-central portion of the RTC, formerly the Test Reactor Area (TRA) (Figure 2).

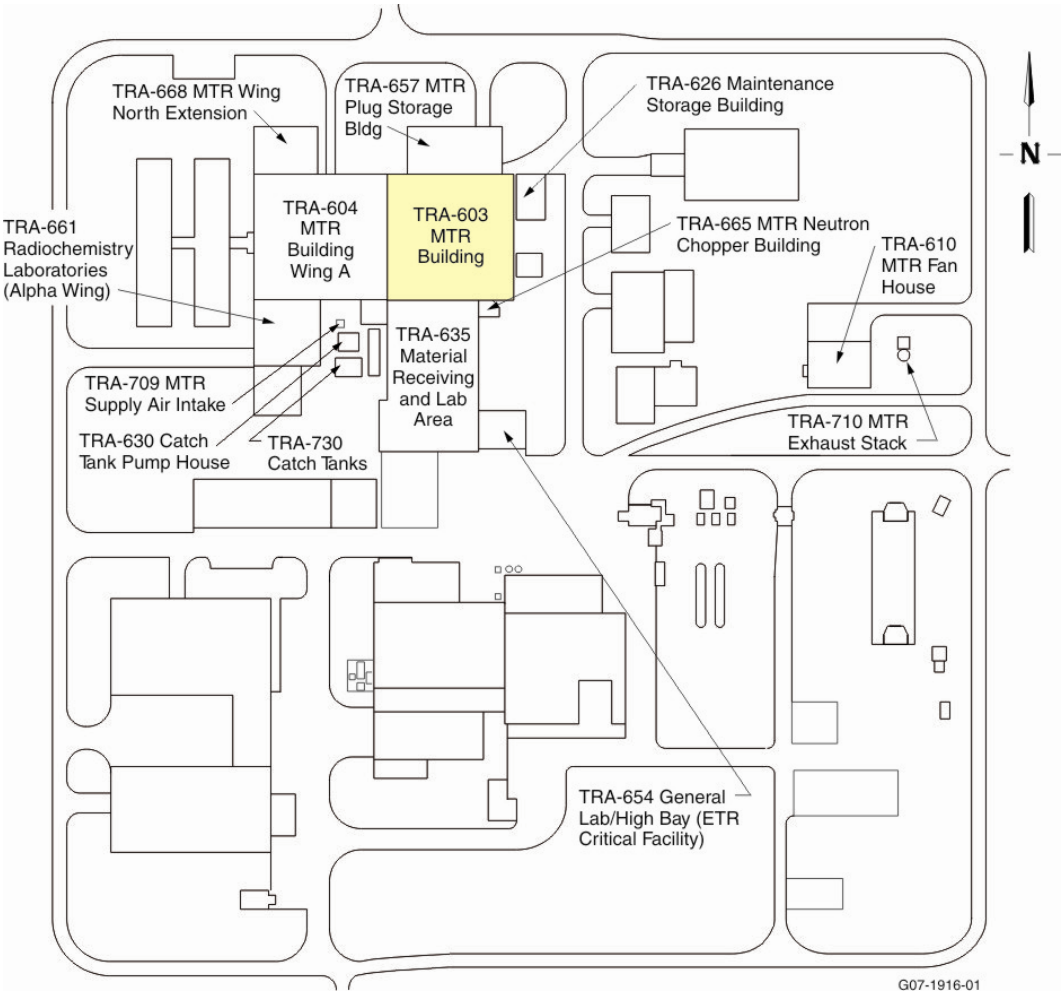

Figure 2. Map of the Reactor Technology Complex, including the south-central portion where the MTR facility is located.

The central core of the reactor was water-filled. The core internals were cooled by water circulating through 61-cm (24-in.) process water lines. Those lines ran to the Warm Waste Treatment System where the water was degassed in three identical flash evaporator units and subsequently cooled. That water was removed in 1979 and the ducts to the Warm Waste Treatment System are now dry.

The MTR vessel is comprised of five primary components, identified as Tanks “A” through “E.” Tanks “A”, “B”, and “E” are fabricated from stainless steel. Tanks “C” and “D” are made of aluminum.

The contaminants of concern (COCs) associated with the MTR vessel are derived from the activation or transmutation of irradiated metals, equipment and piping contaminated with activation and fission products, heavy metals present in structural alloys or used for radiological shielding, and metals used as electrical or thermal conductors and in switches. The radiological source term for the vessel and components (including the beryllium reflector, a potential source of transuranic radionuclides from neutron activation) was calculated based upon ORIGEN2 model simulations of the operation of MTR and MCNP4C simulations of components exposed to the neutron flux to derive the concentrations and total activity of individual radionuclides. In addition to the operational history of the reactor, other model input data are described in Engineering Design File (EDF) -6381 and include materials of construction and data collected regarding impurities contained within the alloys of the metals. For data regarding uranium impurity in the aluminum vessel components, shavings of the vessel exterior were collected and laboratory analyses obtained. These data were then input into the models to obtain and validate the concentrations of transuranic radionuclides.

The MTR beryllium reflector was replaced not long before MTR was shut down and had experienced less than 1,000 megawatt-days (MWd) of reactor operation. Because the reflector was used in the reactor for a relatively short period of time, the total average concentration of transuranic radionuclides in the reflector is estimated at 6 nanocuries/gram (nCi/g).

The reactor operated from March 1952 until August 1970. The Spent Nuclear Fuel Program completed MTR fuel removal in October 2002. Figure 3 is a photograph of the MTR during its early operation period.

Figure 3. The Materials Test Reactor (enclosed by biological shielding) as seen from the southwest during its early operational days.

2.2 Background

Development of the engineering evaluation/cost analysis (EE/CA) for the decommissioning of the MTR facility (DOE-ID 2007a) and this Action Memorandum has been performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 United States Code [USC] § 9601 et seq.), as amended by the "Superfund Amendments and Reauthorization Act of 1986" (Public Law 99-499), and in accordance with the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 Code of Federal Regulations [CFR] 300). Although decommissioning of the MTR facility was not specifically addressed in the *Final Record of Decision Test Reactor Area Operable Unit 2-13, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho* (DOE-ID 1997) or the *Explanation of Significant Differences to the Record of Decision for Test Reactor Area Operable Unit 2-13* (DOE-ID 2000), this removal action is consistent with the remedial action objectives (RAOs) of the Record of Decision (ROD) and supports the overall remediation goals established through the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991) process for Waste Area Group 2. Waste Area Group 2 is located at the RTC within the INL Site. The removal action will place the facility in a final configuration that remains protective of human health and the environment. Preparation of this Action Memorandum is consistent with the joint DOE and U.S. Environmental Protection Agency (EPA) *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act* (DOE and EPA 1995), which establishes the CERCLA non-time-critical removal action (NTCRA) process as an approach for decommissioning.

The scope of this Action Memorandum is the final end state of the MTR facility and final disposal site for the MTR vessel. Deactivation activities are proceeding in accordance with the *Action Memorandum for General Decommissioning Activities under the Idaho Cleanup Project* (DOE-ID 2006) in advance of this NTCRA Action Memorandum and are not included in the scope of the NTCRA. These initial activities involve removal of some piping and equipment and routine waste management practices such as removal of lead, polychlorinated biphenyls (PCBs), and asbestos. In addition, some demolition of support buildings and structures is proceeding in advance of the NTCRA. It is important to understand that a substantial amount of work will have been completed prior to finalization of this Action Memorandum.

The purpose of the NTCRA process is to determine

- The final end state of the MTR facility (TRA-603) abovegrade and belowgrade structure
- The final disposition of the MTR vessel
- The risks to human health and the environment associated with leaving contamination at the MTR facility.

The Idaho CERCLA Disposal Facility (ICDF) is the preferred disposal location for wastes meeting the ICDF Waste Acceptance Criteria (WAC) (DOE-ID 2007b). For wastes eligible for disposal as solid wastes, the Central Facilities Area (CFA) Industrial Waste Landfill will be utilized for wastes generated during decommissioning activities at the MTR facility. When the decommissioning involves management and/or generation of wastes subject to regulation under the Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act (HWMA/RCRA) (IC § 39-4401 et seq.), these wastes will be addressed pursuant to requirements of those regulations.

Performance of this removal action will place the facility in a configuration that is protective of human health and the environment. Without decommissioning the MTR facility, a potential threat of release of hazardous substances exists and, without action, adverse threats to human health and the

environment eventually could occur. As the lead agency, DOE has determined that a removal action is an appropriate means to accomplish the final end state and achieve environmental review requirements. Both the Idaho Department of Environmental Quality (DEQ) and the EPA concur that a NTCRA is warranted to place these facilities in a configuration that is protective of human health and the environment.

2.3 Other Actions to Date

Closure/cleanup activities have taken place and will continue at RTC and MTR under numerous programs and regulatory authorities. The following sections briefly describe those activities.

2.3.1 Comprehensive Environmental Response, Compensation, and Liability Act Activities at the RTC

The CERCLA Final ROD for TRA OU 2-13 (DOE-ID 1997) and *Explanation of Significant Differences to the Record of Decision for Test Reactor Area Operable Unit 2-13* (DOE-ID 2000) selected a remedy for the cleanup of identified contaminated soil at the RTC. Remedies also were selected for the warm waste pond, perched water system, chemical waste pond, and sewage leach pond. Remedial actions specified by the ROD (DOE-ID 1997) have been completed under CERCLA (CERCLIS ID Number ID4890008952) at Waste Area Group 2 and, as required under CERCLA (42 USC § 9601 et seq.) whenever contamination is left in place, institutional controls have been implemented for residual contaminants left in place at concentrations that would not allow for unrestricted use or access. Fifteen sites were found to require institutional controls to ensure adequate protection of human health and the environment. The Explanation of Significant Differences (DOE-ID 2000) discusses implementation, maintenance, and monitoring of institutional controls at each RTC site in detail.

Groundwater monitoring under CERCLA has been ongoing at the RTC in accordance with the requirements of the Operable Unit (OU) 2-12 and OU 2-13 RODs (DOE-ID 1992, 1997). On October 7, 1991, the EPA designated the Snake River Plain Aquifer (SRPA) a sole-source aquifer under the Safe Drinking Water Act (42 USC § 300f et seq.). The SRPA and perched water beneath the RTC are monitored extensively, because changes in these sites could be indicative of the effectiveness of the remedies in place at the OU 2-13 sites or could indicate the occurrence of a new release.

2.3.2 Voluntary Consent Order Activities

The Voluntary Consent Order (VCO) Program was responsible for characterizing many of the support systems associated with the MTR that may have included RCRA (42 USC § 6901 et seq.) hazardous wastes. These included the waste systems (hot and warm), the MTR vessel, the primary cooling system, the experimental mockup systems, and the steam system. These characterization efforts led to further actions under the VCO.

The pipe tunnel sump was found to contain sediment that was characterized as hazardous for cadmium (D006) and lead (D008). Since this sump was never used for the systematic and routine management of hazardous waste, a VCO milestone to remove and appropriately disposition the sediment from this sump was established (Gregory 2005a). On June 22, 2005, the DOE-ID submitted documentation that the sediment had been removed and appropriately dispositioned from the pipe tunnel sump (Wessman 2005). The DEQ approved the disposition records and movement of the pipe tunnel sump to Appendix C of the VCO Action Plan on July 29, 2005 (Gregory 2005b).

The reactor drain tank, the canal sump, and ancillary equipment that were characterized as RCRA hazardous are subject to RCRA closure. The next VCO action, submittal of a RCRA Closure Plan for DEQ review and approval, was completed in March 2007 with DEQ approval issued April 27, 2007 (Gregory 2007).

2.3.3 Other Decommissioning Activities

Decommissioning of the ETR complex buildings is currently underway at the RTC in accordance with the *Action Memorandum for Decommissioning the Engineering Test Reactor Complex under the Idaho Cleanup Project* (DOE-ID 2007c). The ETR complex is immediately adjacent and to the south of the MTR complex. These buildings and the ETR vessel are also undergoing decommissioning as a CERCLA NTCRA. The selected alternative under the Action Memorandum was for removal of abovegrade buildings and structures and disposal of the ETR vessel at the ICDF.

At the MTR facility, hazardous waste, such as mercury vapor lamps and fluorescent bulbs, lead shielding, and circuit boards containing lead and/or silver soldering, is currently being removed and disposed of. Other decommissioning preparatory activities for the MTR facility and decommissioning of other facilities associated with the MTR complex are currently proceeding under the *Action Memorandum for General Decommissioning Activities under the Idaho Cleanup Project* (DOE-ID 2006). These activities include

1. Asbestos Abatement: Decommissioning preparatory activities also include removal of friable asbestos that might be found in pipe and tank/vessel insulation, fire doors, transite panels, and other potential asbestos-containing material, as required under 40 CFR 61.145, "Standard for Demolition and Renovation."

2. Removal of Other Support Systems and Components from the MTR Complex: These activities include draining or emptying systems containing liquids and removing and properly managing electrical cabinets, hoods, sinks, mixing tanks, and counters according to the waste characterization. These activities also include deenergizing and isolating utilities and reconfiguring those systems (as necessary) to support continuing RTC operations. In addition, chlorofluorocarbons used as refrigerants will be removed in accordance with the requirements of Section 609 of the Clean Air Act (42 USC § 7401 et seq., as amended), and waste regulated under the Toxic Substances Control Act (TSCA) (15 USC § 2601 et seq.) is being removed, such as PCB articles and equipment (e.g., transformers, capacitors, and fluorescent lighting ballasts might contain PCBs).

2.4 State and Local Authorities Role

This Action Memorandum covering the MTR facility decommissioning activities at DOE's INL Site is conducted by DOE with the concurrence of EPA and DEQ.

3. THREAT TO PUBLIC HEALTH, WELFARE, AND/OR THE ENVIRONMENT

The source of contamination in the building or structures addressed by this Action Memorandum has been characterized or estimated based on process knowledge and using conservative assumptions. In general, contamination at this facility resulted from activities associated with research, testing, and processing of nuclear materials. Various resources were used to help identify the hazardous substances and the nature and extent of contamination in the facilities. These resources included historical operations

information, process knowledge, radiological survey reports, radiation occurrence reports, facility assessment reports, personnel interviews, facility characterization reports, vulnerability assessments, inspections, walkdowns, and knowledge of construction materials.

To the extent practicable, hazardous substances—including lead, mercury, and PCBs—have been or will be removed from the facilities. However, residual contamination may remain on facility surfaces, in piping and ductwork, and in structural materials.

The major COCs within the building and structures subject to this removal action are radionuclides, which are known carcinogens. Approximately 99% of the radioactive material inventory in the MTR facility is present within the MTR vessel itself.

The "National Oil and Hazardous Substance Pollution Prevention Contingency Plan" (40 CFR 300.415(b)(2)) establishes factors to be considered in determining the appropriateness of a removal action. Those factors include the following:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants
- Weather conditions that may cause hazardous substances, pollutants, or contaminants to migrate or be released
- Hazardous substances or pollutants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.

Hazardous substances, including radionuclides, are present within the equipment, structures, and MTR vessel. If the MTR facility is not properly maintained in the future, potential releases could occur that may pose an unacceptable risk to receptors. The external radiation, inhalation, and ingestion risks to Site workers, the public, and ecological receptors associated with potential releases of contamination justify a NTCRA.

Conditions at this site meet the criteria for NTCRA as stated in the National Contingency Plan, 40 CFR 300.415, as follows:

A. Threats to Public Health or Welfare

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations or the food chain [300.415(b)(2)(i)].

   While access to the site is restricted, there is the potential that over time the structure will decay and the radionuclides could be released into the environment. This would create the potential for exposure to high concentrations of radionuclides via inhalation of wind-blown dust from debris or direct ingestion of contaminated soils by nearby populations and users of the site. The location of the MTR facility is approximately 9 miles from the boundary of the INL Site. The land use of the property outside of the INL Site boundary is agriculture, including grazing and other agriculture uses.

2. Weather conditions that may cause hazardous substances, pollutants, or contaminants to migrate or be released [300.415(b)(2)(v)].

   Seasonal weather extremes at the INL Site vary from subzero winter conditions to summer temperatures in excess of 100ºF. Additionally, windy conditions are common. This exposure to the elements will contribute to the eventual degradation of the building

and potential release of contaminants to the environment and transport via wind to receptors.

3. High levels of hazardous substances or pollutants in soil largely at or near the surface that may migrate [300.415(b)(2)(iv)].

   The total activity from radionuclides at this site is 757 Ci, which represents a 4-in-1,000 cancer risk. If no action were taken, there exists the potential for this contamination to be ingested or transported via wind to receptors.

4. ENDANGERMENT DETERMINATION

Actual or threatened release of hazardous substances from the site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

As the MTR facility continues to age, the threat of substantial release of radiological and hazardous substances increases with time, and containing these materials and preventing them from being released to the environment becomes more difficult. The surveillance and maintenance (S&M) activities required to confine the hazardous substances may increase the risk of potential exposure to personnel.

The potential exposure to workers, the potential threat of future releases, and the substantial risks associated with the radiological and hazardous substances at the facility addressed by this Action Memorandum justify use of CERCLA removal action authority in accordance with 40 CFR 300.415(b)(2) of the "National Oil and Hazardous Substances Pollution Contingency Plan." Actual and/or threatened releases of hazardous substances from these facilities have the potential to present a threat to public health and/or the environment.

4.1 Removal Action Objectives

The RAOs for this NTCRA are to perform final decommissioning of the MTR facility consistent with or more conservative than the OU 2-13 RAOs to achieve the following:

- Inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk greater than 1 in 10,000 to 1 in 1,000,000 for current and future workers and future residents
- Inhibit ingestion of radionuclide and nonradiological COCs by all affected exposure routes (including groundwater, soil, and homegrown produce ingestion) that would result in a total excess cancer risk greater than 1 in 10,000 to 1 in 1,000,000 or a hazard index of 1 or greater for current and future workers and future residents
- Prevent unacceptable internal exposure to biota that would result in the lack of maintenance or recovery of healthy local populations/communities of ecological receptors that are or should be present at or near the site.

In addition to the remediation objectives established through the Federal Facility Agreement/Consent Order process, the selected alternative should incorporate the DOE goal of reducing the "risk footprint" by consolidating wastes in the ICDF and reducing S&M costs on legacy buildings and structures.

Actions conducted under this NTCRA would be reviewed with DEQ and EPA for continued protectiveness during the Sitewide CERCLA 5-year review process prescribed under the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991).

4.2 Engineering Evaluation/Cost Analysis

Engineering Evaluation/Cost Analysis for the Materials Test Reactor Facility End-State and Vessel Disposal (DOE-ID 2007a) is available through the Administrative Record for the removal action and can be found at the following internet address: http://ar.inel.gov.

Two alternatives and a no action alternative were evaluated in the EE/CA for the MTR facility NTCRA. These alternatives are described in detail in the EE/CA. The recommended alternative is to demolish the building to below ground level and dispose of the vessel at the on-Site ICDF.

4.2.1 Alternative 1—No Action

Under the no action alternative, no removal action would be conducted on the MTR vessel and there would be no further S&M at the facility. Under this alternative, all radiological and nonradiological chemical constituents would be assumed to remain in place to become available to human and ecological receptors. The no action alternative is a conservative baseline assumption, in that the sum of all identified chemical and/or radiological contamination, if not properly contained or controlled, may be released to the environment, causing an unacceptable risk to potential receptors (current and future workers, hypothetical future residents, and the environment). The assumption is for comparative purposes only and does not reflect the DOE mandate to provide monitoring, perform maintenance, and mitigate potential or actual releases from any facility or site to ensure protection to the public and the environment. The assumption only delays the need for a future action.

4.2.2 Alternative 2—Removal of the Abovegrade Structure with Containment of the MTR Vessel

For Alternative 2, the MTR vessel would be filled with a grout and the aboveground portions of the vessel and the bioshield would be encapsulated in a concrete monolith. The aboveground reactor facility would be demolished. Belowgrade structures and systems, including piping, utility systems, and structural steel, would be abandoned in place. In addition, residual radioactive materials in the MTR facility remaining after decommissioning and demolition activities are complete would remain in place and would be managed under the Sitewide Institutional Control Program. Void spaces would be grouted as necessary and/or backfilled as practicable using inert demolition waste from the abovegrade structures and uncontaminated clean backfill materials.

4.2.3 Alternative 3—Removal of the Abovegrade Structure with Removal and Disposal of the MTR Vessel

Alternative 3 would include removal and disposal of the MTR vessel at an on-Site disposal facility (ICDF). The reactor facility would be demolished to below ground level; structures and systems below ground surface consisting of inert materials, such as piping, tanks, structural metal, and utility systems, would be abandoned in place. Residual radioactive materials in the MTR facility remaining after decommissioning and demolition activities are completed would stay in place and would be managed under the Sitewide Institutional Control Program. Void spaces would be backfilled as practicable, including the void left by removal of the MTR vessel. Backfill would consist of grout, as necessary, and/or inert demolition waste from the abovegrade structures and uncontaminated clean backfill materials.

The vessel will be grouted, as necessary, to stabilize and shield the internal reactor components during transportation and to meet required disposal facility WAC (DOE-ID 2007b) for reducing void space to prevent subsidence.

4.3 Selected Alternative

The alternatives evaluated in the EE/CA are discussed in Section 4.2. The selected alternative is Alternative 3 and includes removing and disposing of the MTR vessel at the ICDF and demolishing the reactor building to below ground surface.

The selected alternative meets the RAOs regarding long-term risk, minimizes short-term worker risk and radiation exposure, reduces the footprint of waste sites at the INL Site, is cost effective, and provides a safe and stable configuration that is environmentally sound. The end state provided by Alternative 3 is consistent with the DOE goal to minimize long-term S&M costs by reducing the footprints and consolidating waste from contaminated facilities.

The MTR vessel meets the ICDF WAC and would be transported and disposed of as low-level radioactive waste at the ICDF. Any remaining voids in the vessel would be filled with grout at the disposal site. The aboveground portions of the reactor building would be demolished to below ground surface and the resultant demolition material could be used as backfill or disposed of in accordance with the applicable disposal site WAC. Materials left in place include inert, nonputrescible material located below the ground surface, such as piping, equipment, electrical conduit, utility systems, structural steel, and other residual clean or contaminated materials with low-level radioactive and/or chemically hazardous substances that do not present an unacceptable risk in accordance with the RAOs for the ROD (DOE-ID 1997) and the Explanation of Significant Differences (DOE-ID 2000). Excavations and remaining belowgrade structures would be grouted as necessary and backfilled to grade. Clean soil would cover the locations of the TRA-603 building and structures.

4.4 Compliance with Environmental Regulations, Including Those That Are Applicable or Relevant and Appropriate Requirements

Section 121 of CERCLA (42 USC § 9621) requires the responsible CERCLA implementing agency to ensure that the substantive standards of HWMA/RCRA and other applicable laws will be incorporated into the federal agency's design and operation of its long-term remedial actions and into its more immediate removal actions. DOE-ID is the implementing agency for this NTCRA. Both DEQ and EPA concur that an NTCRA is warranted to protect human health and the environment. Through the NTCRA process, the risks presented in this document will be mitigated in a timely manner.

Table 1 lists the proposed applicable or relevant and appropriate requirements (ARARs) that have been identified for this removal action. These ARARs are a compilation and expansion of the ARARs identified in the ROD (DOE-ID 1997). The ARARs list is based on several key assumptions:

- Any residual contamination left in place will meet the RAOs established in the ROD (DOE-ID 1997).
- Liquid waste (e.g., radioactive water) is assumed to have been removed from the MTR facility prior to initiation of the NTCRA. The liquid waste will have been previously addressed through the VCO Program and other regulatory activities to resolve potential compliance issues with provisions of the HWMA/RCRA. Any residual liquids discovered during decommissioning activities will be disposed of in accordance with the receiving disposal facility's WAC.

- The majority of lead shielding will be removed from MTR prior to initiation of this NTCRA through other regulatory activities intended to place the facility in an environmentally safe condition. However, some lead, such as difficult-to-remove lead incidental to demolition and/or lead enclosed or encapsulated in building structural material, may remain in place following these activities. This will require management under the scope of the NTCRA as CERCLA waste. In addition, some incidental lead may be managed under the scope of the NTCRA as CERCLA waste and be disposed of in the ICDF according to the WAC. Removed lead that cannot be recycled or reclaimed shall be declared a hazardous waste or mixed low-level waste, shall be managed in accordance with the substantive requirements of the HWMA/RCRA (IDAPA 58.01.05.008), and will be disposed of at an off-Site disposal facility in accordance with the disposal facility WAC.

- Management of CERCLA waste generated during the removal action would be subject to meeting the ICDF's WAC (DOE-ID 2007b). Noncontaminated wastes generated during the CERCLA activities may be eligible for disposal at the CFA Landfill.

- Debris generated during removal of the vessel might have paint that contains PCBs. If encountered, such waste may trigger substantive requirements of the TSCA (15 USC § 2601 et seq.). Lead-contaminated paint also may be removed during recovery of the shielding lead, which would be subject to the substantive requirements of RCRA hazardous waste regulations. Nonhazardous waste would be disposed of at the ICDF, unless it can be demonstrated that it is eligible for disposal as solid waste at the CFA Landfill Complex. Removal is planned for the PCB-containing light ballasts from the building prior to this removal action. PCB-containing light ballasts are disposed of at an off-Site disposal site in accordance with the disposal site WAC.

- Asbestos-containing material, which is both friable and nonfriable, may be encountered incidental to performance of the NTCRA. Friable or regulated asbestos-containing material is subject to specific asbestos regulations and would be acceptable for disposal at ICDF and/or, if not radiologically contaminated, at the CFA Asbestos Landfill. Regulated asbestos will be removed and disposed of as required by 40 CFR 61.150, "Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations." Undisturbed asbestos or asbestos found in high-radiation, high-contamination, and/or inaccessible locations greater than 10 ft below the ground surface may be left in place.

- If decontamination liquids are generated, they will be disposed of at the ICDF evaporation ponds in accordance with the approved WAC.

- Mercury located in mercury fluorescent lamps is planned for removal prior to this removal action under other regulatory activities intended to place the facility in an environmentally safe condition, as are the mercury-containing electrical switches and lights. No mercury is expected to be present in the building substructure at the start of the removal action.

Table 1. Summary of applicable or relevant and appropriate requirements for the Materials Test Reactor facility non-time-critical removal action.

Requirement (Citation)	ARAR Type	Comments
Clean Air Act and Idaho Air Regulations		
"Toxic Substances," IDAPA 58.01.01.161	A	Applies to any toxic substances emitting during implementation of the removal action.
<10 mrem/yr, 40 CFR 61.92, "Standard"	A	Applies to the waste handling activities.
"Emission Monitoring and Test Procedures," 40 CFR 61.93	A	Applies to the waste handling activities.
"Compliance and Reporting," 40 CFR 61.94(a)	A	Applies to the waste handling activities.
"Standard for Demolition and Renovation," 40 CFR 61.145	A	Applies to any asbestos-containing materials removed during the decommissioning.
"Rules for Control of Fugitive Dust," and "General Rules," IDAPA 58.01.01.650 and .651	A	Applies to the waste handling activities.
Idaho Solid Waste Facilities Act		
"Applicable Requirements for Tier II Facilities," IDAPA 58.01.06.012	A	Applies to disposal of solid wastes at the CFA Landfill.
RCRA and Idaho Hazardous Waste Management Act		
Generator Standards:		
"Standards Applicable to Generators of Hazardous Waste," IDAPA 58.01.05.006, and the following, as cited in it:		
"Hazardous Waste Determination," 40 CFR 262.11	A	Applies to waste that would be generated during the removal action.
General Facility Standards:		
"Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," IDAPA 58.01.05.008, and the following, as cited in it:		
"Temporary Units (TU)," 40 CFR 264.553	A	Waste may be treated or temporarily stored in a temporary unit prior to disposal.
"Staging Piles," 40 CFR 264.554	A	Waste may be temporarily staged prior to disposal.
"General Inspections Requirements," 40 CFR 264.15	A	Applies to a facility staging, storing, or treating hazardous waste prior to transfer to the ICDF or an off-Site facility.

Table 1. (continued).

Requirement (Citation)	ARAR Type	Comments
"Preparedness and Prevention," 40 CFR 264, Subpart C	A	Applies to a facility staging, storing, or treating hazardous waste prior to transfer to the ICDF or an off-Site facility.
"Contingency Plan and Emergency Procedures," 40 CFR 264, Subpart D	A	Applies to a facility staging, storing, or treating hazardous waste prior to transfer to the ICDF or an off-Site facility.
"Disposal or Decontamination of Equipment, Structures, and Soils," 40 CFR 264.114	A	Applies to contaminated equipment used to remove, treat, or transport hazardous waste.
"Use and Management of Containers," 40 CFR 264.171-178	A	Applies to containers used during the removal and treatment of hazardous waste.
Land Disposal Restrictions:		
"Land Disposal Restrictions," IDAPA 58.01.05.011, and the following, as cited in it:		
"Applicability of Treatment Standards," 40 CFR 268.40(a)(b)(e)	A	Applies to hazardous waste and secondary waste, if treatment is necessary to meet the disposal facility's WAC or if treatment is required before placement.
"Treatment Standards for Hazardous Debris," 40 CFR 268.45	A	Applies to hazardous debris, if treatment is necessary to meet the disposal facility's WAC or if treatment is required before placement.
"Universal Treatment Standards," 40 CFR 268.48(a)	A	Applies to nondebris hazardous waste and secondary waste, if treatment is necessary to meet the disposal facility's WAC or if treatment is required before placement.
"Alternative LDR Treatment Standards for Contaminated Soil," 40 CFR 268.49	A	Applies to contaminated soil, if treatment is necessary to meet the disposal facility's WAC or if treatment is required before placement.
"Standards for Universal Waste Management," IDAPA 58.01.05.016		
"Standards for Large Quantity Handlers of Universal Waste," 40 CFR 273, Subpart C	A	Applies to management of universal wastes.
Idaho Groundwater Quality Rules		
"Ground Water Quality Rule," IDAPA 58.01.011	A	The State of Idaho Ground Water Quality Rule's regulated contaminants are equivalent to the Clean Water Act maximum contaminant levels. The waste handling activities must prevent migration of contaminants from the reactor complex that would cause the SRPA groundwater to exceed applicable State of Idaho groundwater quality standards in 2095 and beyond.

Table 1. (continued).

Requirement (Citation)	ARAR Type	Comments
TSCA		
"Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," 40 CFR 761	A	Applicable to removal, decontamination, storage, and disposal of items, (including equipment) with PCB contamination.
Migratory Bird Treaty Act of 1918		
"Protection of Migratory Game and Insectivorous Birds," 16 USC 7	A	Applies to disturbances of nesting migratory birds.
To-Be-Considered Requirements		
"Radiation Protection of the Public and the Environment," DOE Order 5400.5, Chapter II(1)(a,b)	TBC	Applies to the MTR complex TRA-603 before, during, and after the removal action. Substantive design and construction requirements would be met to keep public exposures as low as reasonably achievable.
"Radioactive Waste Management," DOE Order 435.1	TBC	Applies to the MTR complex TRA-603 before, during, and after the removal action. Substantive design and construction requirements would be met to protect workers.
Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities (EPA 2006)	TBC	Applies to residual waste following completion of the removal action.

A = applicable requirement; TBC = to be considered.
ARAR = applicable or relevant and appropriate requirement.
CFA = Central Facilities Area.
CFR = *Code of Federal Regulations.*
DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
ICDF = Idaho CERCLA Disposal Facility.
IDAPA = Idaho Administrative Procedures Act.
LDR = land disposal restriction.
MTR = Materials Test Reactor.
PCB = polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
SRPA = Snake River Plain Aquifer.
TSCA = Toxic Substances Control Act.
USC = *United States Code.*
WAC = Waste Acceptance Criteria.

4.5 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) (16 USC § 470 et seq.), as amended, requires agencies to consider the impact of undertakings on properties listed or eligible for listing in the National Register of Historic Places and to consult with the Idaho State Historic Preservation Officer and other interested parties when impacts are likely. It also requires federal agencies to invite the Advisory Council on Historic Preservation to participate in consultation when impacts may be adverse. Section 110 of the NHPA directs federal agencies to establish programs to find, evaluate, and nominate eligible properties to the National Register of Historic Places, including previously unidentified historic properties that may be discovered during the implementation of a project (36 CFR 800). In addition, the Archaeological Resources Protection Act of 1979 (16 USC § 470aa–470mm), as amended, provides for the protection and management of archaeological resources on federal lands. Procedures and strategies to tailor these requirements to the unique needs of the INL Site are described in the INL Cultural Resource Management Plan (CRMP) (DOE-ID 2005a). The INL CRMP is implemented through a Programmatic Agreement among DOE-ID, the Idaho State Historic Preservation Officer, and the Advisory Council on Historic Preservation (DOE-ID 2005a, Appendix K).

The MTR facility is a historic property, eligible for nomination to the National Register of Historic Places. DOE-ID has made the decision to proceed with demolition of the facility. To mitigate the adverse impacts caused by such action, DOE-ID, through measures outlined in the INL CRMP and by a 2005 Memorandum of Agreement between DOE and the Idaho State Historic Preservation Office (DOE-ID 2005b) and the 2004 Programmatic Agreement, has committed to the preservation of the MTR history through the completion of a Historic American Engineering Record (HAER) report for TRA. The TRA HAER has been completed and transmitted to the National Park Service (Gilbert and Stacy 2006). The HAER will ultimately be accessioned into the Library of Congress' permanent collections.

DOE is required to review as guidance the most current U.S. Fish and Wildlife Service list for threatened and endangered plant and animal species. DOE-ID determined that none of the alternatives would impact any threatened and endangered species and also determined that formal consultation with the U.S. Fish and Wildlife Service is not required for this action.

4.6 ICDF Waste Acceptance Criteria

The ICDF is an on-Site disposal facility that accepts CERCLA waste generated at the INL Site. The MTR vessel meets the WAC for disposal at the ICDF. Grout will be added, as necessary, to stabilize and shield the vessel internals for shipment and reduce void spaces to prevent subsidence in the disposal cell.

5. PROJECT SCHEDULE

Final decommissioning activities are expected to commence upon issuance of this Action Memorandum. Decommissioning of the MTR facility is estimated to be completed by the fall of 2008.

6. PROJECT COST

Cost estimates were prepared for the alternatives evaluated in the EE/CA (DOE-ID 2007a). The estimates were prepared in accordance with *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000). Costs were calculated for both capital expenditures and future operation and maintenance expenses. In accordance with EPA guidance, the cost for the alternatives over time was calculated as present net worth costs, which are sometimes referred to as net present value, to represent the costs in 2007 dollars.

The cost estimate is based upon the best available information regarding the anticipated scope of the selected alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design and performance of the removal action. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30% of actual project cost. The total estimated cost of the selected alternative is $7,800,000.

7. EXPECTED CHANGE SHOULD ACTION BE DELAYED OR NOT TAKEN

The expected change to the MTR facility building and structures should action be delayed or not taken would be that the facilities would remain under administrative and institutional control. However, as the facilities continue to age, the threat of substantial release of radiological and hazardous substances increases with time, and containing these materials and preventing them from being released to the environment become more difficult. The S&M activities required to confine the hazardous substances may increase the risk of potential exposure to personnel. If the action was delayed, continued expenditures for S&M costs would accrue during the time interval elapsed until final decommissioning activities are performed.

8. STATUTORY AND REGULATORY AUTHORITY

The proposed removal action is being undertaken by DOE-ID, as the lead agency, pursuant to CERCLA, Section 104(a) (42 USC 9604), and Executive Order 12580, as recognized by Section 5.3 of the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991). In accordance with 40 CFR 300.415(j) and DOE guidance, on-Site removal actions conducted under CERCLA are required to meet ARARs to the extent practicable considering the exigencies of the situation. DOE-ID will comply with the ARARs and the "to-be-considered" guidance as set forth in Section 4.4.

9. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues.

10. ENFORCEMENT

DOE-ID is conducting this removal action as the lead agency under the authority of 40 CFR 300.5, "Definitions," and 40 CFR 300.415(b)(1).

11. RECOMMENDATION

DOE-ID recommends implementation of Alternative 3, "Removal of the Abovegrade Structure with Removal and Disposal of the MTR Vessel," with disposal at the ICDF. The ICDF is a state-of-the-art, multiple-lined, and monitored on-Site disposal facility that offers greater protection to human health and the environment than disposal at the unlined disposal cells at Radioactive Waste Management Complex. The vessel would be filled with grout (as necessary) to stabilize vessel internals and reduce radiological dose. The MTR vessel would be transported and disposed of as low-level radioactive waste at the ICDF in full compliance with the ICDF WAC. Any remaining voids in the vessel would be filled with grout at the disposal site.

The aboveground portions of the reactor building would be demolished to below ground surface and the resultant demolition material may be used as backfill or disposed of in accordance with the applicable disposal site WAC. Materials left in place include inert, nonputrescible material located below the ground surface, such as piping, equipment, electrical conduit, utility systems, structural steel, and other residual clean or contaminated materials with low-level radioactive and/or chemically hazardous substances that do not present an unacceptable risk in accordance with the RAOs for the ROD (DOE-ID 1997) and the Explanation of Significant Differences (DOE-ID 2000). Excavations and remaining belowgrade structures will be backfilled to grade. Clean soil would cover the locations of the TRA-603 building and structures.

The recommended alternative meets the proposed RAOs regarding long-term risk, minimizes short-term worker risk and radiation exposure, is cost effective, and provides a safe and stable configuration that is environmentally sound. DOE-ID also considers Alternative 3 compliant with ARARs.

12. PUBLIC PARTICIPATION

The public review period began on July 13, 2007, and concluded on August 11, 2007. One public comment was received. Appendix A includes the comment received and response provided.

13. REFERENCES

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40 CFR 300.415, 2007, "Removal Action," *Code of Federal Regulations*, Office of the Federal Register, August 2007.

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Appendix A

Responses to Significant Comments on the Engineering Evaluation/Cost Analysis for the Materials Test Reactor Facility End State and Vessel Disposal

Appendix A

Responses to Significant Comments on the Engineering Evaluation/Cost Analysis for the Materials Test Reactor Facility End State and Vessel Disposal

Comment No.	Comment/Issue	Resolution
1.	Of the alternatives presented, I agree with the preferred alternative. I have some reservations of disposal of the reactor vessel in the ICDF. I realize that at the moment it is likely the only location it can be placed though has the possibility of above ground storage anticipating Yucca Mountain's opening been explored?	Thank you for your comment and concurrence on the preferred alternative. Because the MTR reactor vessel is classified as low level waste, it would not meet the acceptance criteria for Yucca Mountain which can only accept waste classified as high level waste.