DOE/ID-11370
Revision 6

U.S. Department of Energy
Idaho Operations Office

Preliminary Project Execution Plan for the Remote-Handled Low-Level Waste Disposal Project

May 2011

Idaho National Laboratory

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

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EXECUTIVE SUMMARY

As part of ongoing cleanup activities at the Idaho National Laboratory (INL), closure of the Radioactive Waste Management Complex (RWMC) is proceeding under the Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601 et seq. 1980). INL-generated radioactive waste has been disposed of at RWMC since 1952. The Subsurface Disposal Area (SDA) at RWMC accepted the bulk of INL's contact and remote-handled low-level waste (LLW) for disposal. Disposal of contact-handled LLW and remote-handled LLW ion-exchange resins from the Advanced Test Reactor in the open pit of the SDA ceased September 30, 2008. Disposal of remote-handled LLW in concrete disposal vaults at RWMC will continue until the facility is full or until it must be closed in preparation for final remediation of the SDA (approximately at the end of fiscal year FY 2017).

The continuing nuclear mission of INL, associated ongoing and planned operations, and Naval spent fuel activities at the Naval Reactors Facility (NRF) require continued capability to appropriately dispose of contact and remote-handled LLW. A programmatic analysis of disposal alternatives for contact and remote-handled LLW generated at INL was conducted by the INL contractor in Fiscal Year 2006; subsequent evaluations were completed in Fiscal Year 2007. The result of these analyses was a recommendation to the Department of Energy (DOE) that all contact-handled LLW generated after September 30, 2008, be disposed offsite, and that DOE proceed with a capital project to establish replacement remote-handled LLW disposal capability. An analysis of the alternatives for providing replacement remote-handled LLW disposal capability has been performed to support Critical Decision-1. The highest ranked alternative to provide this required capability has been determined to be the development of a new onsite remote-handled LLW disposal facility to replace the existing remote-handled LLW disposal vaults at the SDA. Several offsite DOE and commercial disposal options exist for contact-handled LLW; however, offsite disposal options are either not currently available (i.e., commercial disposal facilities), practical, or cost-effective for all remote-handled LLW streams generated at INL. Offsite disposal of all INL and tenant-generated remote-handled waste is further complicated by issues associated with transporting highly radioactive waste in commerce; and infrastructure and processing changes at the generating facilities, specifically NRF, that would be required to support offsite disposal.

The INL Remote-Handled LLW Disposal Project will pursue development of a new remote-handled LLW disposal facility to meet mission-critical, remote-handled LLW disposal needs. A formal DOE decision as how to proceed with the project will be made in accordance with the requirements of National Environmental Policy Act (42 USC§ 4321 et seq.).

Remote-handled LLW is generated from nuclear programs conducted at INL, including spent nuclear fuel handling and operations at NRF and operations at the Advanced Test Reactor. Remote-handled LLW also will be generated by new

INL programs and from segregation and treatment (as necessary) of remote-handled scrap and waste currently stored in the Radioactive Scrap and Waste Facility at the Materials and Fuels Complex.

The proposed remote-handled LLW disposal facility must be operational by Fiscal Year 2018 to support uninterrupted INL operations and ensure no disruption of Office of Nuclear Energy and Office of Naval Reactors mission-critical operations. The conceptual design for the proposed disposal facility is similar to that of the current concrete remote-handled LLW disposal vaults in the SDA to accommodate, to the maximum extent possible, uninterrupted operations at the generating facilities and to capitalize on operations experience and cost efficiencies of current remote-handled LLW disposal practices. The proposed disposal facility is planned to be designed and operated as a Hazard Category 2 nuclear facility per DOE-STD-1027, “Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports,” and operated as a Performance Category 1 facility per DOE-STD-1021, “Natural Phenomena Hazards Performance Characterization Guidelines for Structures, Systems, and Components.”

The proposed remote-handled LLW disposal facility will be designed and constructed using a design-build project delivery method. The design-build method was chosen because the project has well defined requirements based on current remote-handled LLW disposal operations at INL, the disposal facility is not complex, and there is limited risk with the design and construction phases of the project. The subcontract(s) will be competitively bid to qualified subcontractors with nuclear facility experience. Responses to the request for proposal will be evaluated using a “best-value” selection process.

This preliminary project execution plan defines DOE project objectives, roles and responsibilities of project participants, project organization, and controls to effectively manage the acquisition of a new remote-handled LLW disposal facility. The plan addresses the policies, requirements, and critical decision responsibilities identified in DOE Order 413.3B, “Program and Project Management for the Acquisition of Capital Assets.” This plan is intended to be a living document that will be periodically updated as the project matures and progresses through the critical decision process.

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ACRONYMS

AACE	Association for the Advancement of Cost Engineering
ATR	Advanced Test Reactor
CD	critical decision
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
FPD	Federal Project Director
FY	fiscal year
INL	Idaho National Laboratory
IPT	Integrated Project Team
LLW	low-level waste
MFC	Materials and Fuels Complex
NE	DOE Office of Nuclear Energy
NEPA	National Environmental Policy Act
NR	DOE Office of Naval Reactors
NRF	Naval Reactors Facility
OPC	other project cost
PEP	project execution plan
PMB	performance measurement baseline
RFP	request for proposal
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
TEC	total estimated cost
TPC	total project cost
WBS	work breakdown structure

Preliminary Project Execution Plan for the Remote-Handled Low-Level Waste Disposal Project

1. INTRODUCTION

This preliminary project execution plan (PEP) defines U.S. Department of Energy (DOE) project objectives, roles and responsibilities of project participants, project organization, and controls to effectively manage acquisition of capital funds for construction of a proposed remote-handled low-level waste (LLW) disposal facility at the Idaho National Laboratory (INL).[a] The plan addresses the policies, requirements, and critical decision (CD) responsibilities identified in DOE Order 413.3B, "Program and Project Management for the Acquisition of Capital Assets." This plan is intended to be a "living document" that will be periodically updated as the project progresses through the CD process to construction and turnover for operation.

1.1 Project Background

As part of ongoing cleanup activities at INL, closure of the Radioactive Waste Management Complex (RWMC) is proceeding under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq. 1980). INL-generated radioactive waste has been disposed of at RWMC since 1952. The Subsurface Disposal Area (SDA) at RWMC accepted the bulk of INL's contact and remote-handled LLW for disposal. Disposal of INL contact-handled LLW and remote-handled LLW ion-exchange resins from the Advanced Test Reactor (ATR) in the open pit of the SDA ceased on September 30, 2008. Disposal of remote-handled LLW in concrete disposal vaults at RWMC will continue until the facility is full or until it must be closed in preparation for final remediation of the SDA (approximately at the end of fiscal year [FY] 2017).

The continuing nuclear mission of INL, associated ongoing and planned operations, and Naval spent fuel activities at the Naval Reactors Facility (NRF) require continued capability to appropriately dispose of contact and remote-handled LLW. DOE's Idaho programs have been coordinating efforts on waste management activities at INL. Plans and projects are in place to address DOE's legacy waste management issues and are being implemented by the DOE Office of Environmental Management and the Office of Nuclear Energy (NE).

A programmatic analysis of disposal alternatives for contact-handled and remote-handled LLW generated at INL was conducted by the INL contractor in FY 2006; subsequent evaluations were completed in FY 2007. The result of these analyses was a recommendation to DOE that all contact-handled LLW generated after September 30, 2008, be disposed offsite and that DOE proceed with a capital project to establish replacement remote-handled LLW disposal capability. An analysis of the alternatives for providing replacement remote-handled LLW disposal capability has been performed to support CD-1. The highest ranked alternative for providing this required capability has been determined to be development of a new onsite remote-handled LLW disposal facility to replace the existing remote-handled LLW disposal vaults in the SDA. Several offsite DOE and commercial disposal options exist for contact-handled LLW; however, similar offsite disposal options are not currently available (i.e., commercial disposal facilities), practical, or cost-effective for all remote-handled LLW streams generated at INL. Offsite disposal of all INL and tenant-generated remote-handled waste is further complicated by

[a] Identification of development of a new onsite remote-handled LLW disposal facility as the highest ranked alternative for providing continued, uninterrupted remote-handled LLW disposal capability does not reflect a decision by DOE, nor does DOE approval of this preliminary PEP and CD-1 supplant DOE's requirement to comply with the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321 et seq. 1969). DOE's commitment to proceed with the project using the highest ranked alternative will not be finalized until CD-2. A final decision on which specific alternative to pursue will not be made until all NEPA documentation is complete, and the Acquisition Executive has had an opportunity to evaluate the CD-2 documentation. Before DOE approval of CD-2, all appropriate NEPA documentation must be complete.

transportation issues associated with transporting highly radioactive waste in commerce and the infrastructure and processing changes at the generating facilities, specifically NRF, that would be required to support offsite disposal.

Remote-handled LLW (i.e., greater than 200 mR/hour on contact) generated at INL includes resins and activated metals. Ion-exchange resins from pool and reactor operations are generated at ATR (approximately 36 m^3/year) and from pool operations at NRF (approximately 8 m^3/year). ATR ion-exchange resin is generated approximately four to six times annually from reactor loop and reactor ion-exchange systems. The generation rate depends on reactor operations and also varies during the years when core internal change-outs are performed. The ATR produces about 3 m^3 of activated metals during reactor core change-out operations, approximately every 8 years. These components require decay time before they can be handled for disposal and are currently in storage at the ATR Complex. During routine operations, NRF currently produces approximately 35 m^3/year of waste material consisting primarily of activated metals. The activated metals stream also includes a limited volume of additional debris that qualifies as remote-handled LLW. In addition, an estimated 40 m^3 of activated metals and debris are expected to be generated from new missions and from processing of co-mingled, remote-handled waste stored in the Radioactive Scrap and Waste Facility at the Materials and Fuels Complex (MFC). Figure 1 presents current and anticipated remote-handled LLW generation rates.

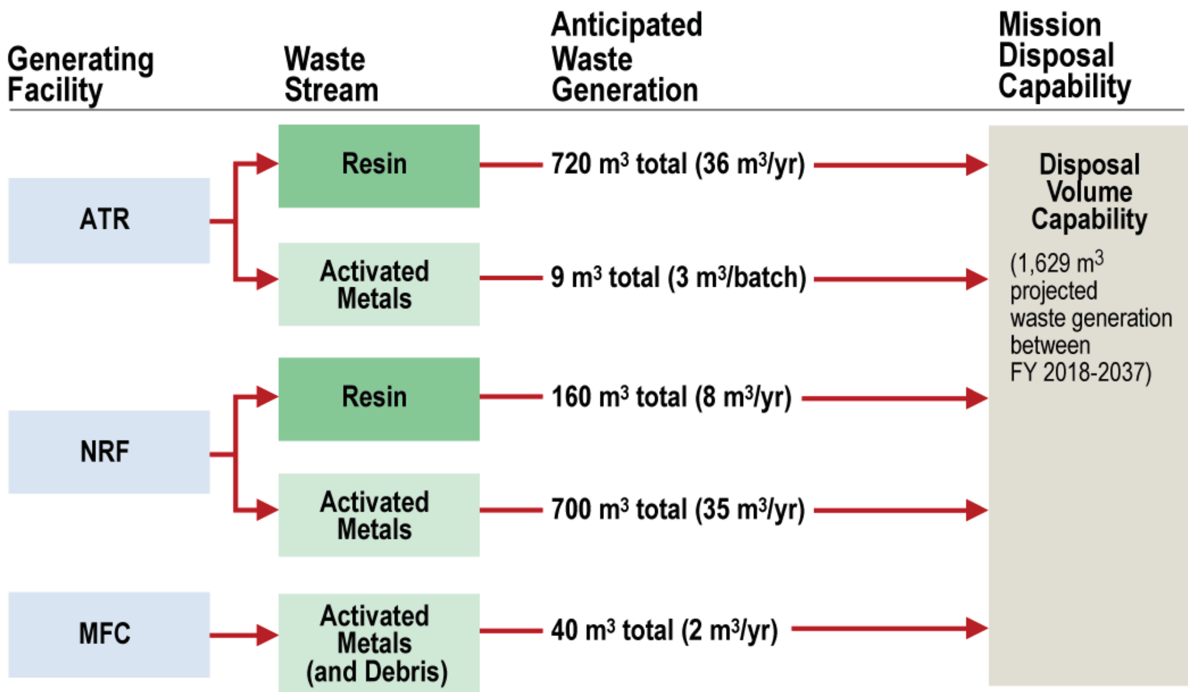


Figure 1. Idaho National Laboratory remote-handled low-level waste generation.

The INL Remote-Handled LLW Disposal Project will pursue development of a new remote-handled LLW disposal facility to provide uninterrupted remote-handled LLW disposal capability. The proposed remote-handled LLW disposal facility must be operational by FY 2018 to support uninterrupted NE and Office of Naval Reactors (NR) mission-related operations. In order for this to occur, INL must do the following:

- Complete all necessary documentation, including the DOE Order 435.1, "Radioactive Waste Management," radiological performance assessment and composite analysis, and complete NEPA (42 USC 4321 et seq. 1969) requirements
- Complete facility design

- Complete construction activities
- Complete operational readiness activities to ensure no disruption of mission-critical operations.

1.2 Project Assumptions

The following key assumptions are associated with development of a proposed onsite remote-handled LLW disposal facility, as reflected in the conceptual design:

1. The facility would be government-owned and contractor-operated. DOE will provide oversight of siting, design, construction, and operation of the facility.

2. Project schedule and cost estimates are based on identifying funding levels that would support uninterrupted project staffing and procurement through design, construction, and startup.

3. The facility would be designed with a design life of 50 years; however, the facility would initially be sized for the volume of waste expected to be disposed of through the year 2037, with potential for continued operation after 2037.

4. Waste accepted for disposal at the facility would primarily consist of resins and activated metals from NRF, the ATR Complex, and MFC. The MFC activated metals waste stream will include significant debris waste material content. Waste volumes used for conceptual design purposes are shown in Figure 1.

5. The facility would be designed to accept waste with a typical contact exposure rate up to 30,000 R/hour.

6. NRF would use its existing 55-ton cask and associated transfer system or similarly designed equipment. Vaults for NRF waste would be sized to accept liners from the shipping cask currently used by NRF.

7. A suitable cask can be procured, designed, and fabricated to transport shipments of activated metal waste generated from the ATR Complex. The cask selected for the ATR remote-handled LLW activated metals also would be used for transport of the activated metals that could be generated from potential new missions and from processing of remote-handled scrap and waste currently stored at MFC.

8. Vaults for waste generated from the ATR Complex, potential new missions, and processing of remote-handled scrap and waste currently stored at MFC would be sized to accept liners compatible with the cask system to be used for waste shipments. Any specific cask-handling equipment needed to use the MFC/ATR metals transport cask would be designed and procured as part of this project.

9. A commercial cask would be used for shipments of the ion-exchange resin waste generated from the ATR Complex. The vaults for this waste would be sized to accept the NuPac 14-210L liners currently used at the ATR Complex. Liner hoisting and rigging components would be designed and procured for the NuPac 14-210L liners as a part of this project. Any specific cask-handling equipment or ancillary equipment specific to the liner design that is needed to unload the liner from the shipping cask and to place the liners into the disposal vaults, other than typical hoisting and rigging components, would be designed and procured as part of the Remote-Handled LLW Disposal Project.

10. Performance assessment characteristics of the selected site location would not result in more restrictive waste acceptance criteria for radionuclide content than the current remote-handled vaults at RWMC.

11. A new documented safety analysis would be required for the disposal facility.

12. Changes to infrastructure at waste-generating facilities are not included as part of the scope of this project.

13. The Remote-Handled LLW Disposal Project is based on development and approval of the project as a line item construction project per DOE Order 413.3B.

1.2.1 Project Uncertainties

In executing this project and completing the planning process, uncertainties about given aspects of the project require identification to clarify assumptions and act as the basis for establishing a risk management plan. The following broad assumptions should be considered. These uncertainties have been captured in the Project Risk Register by one or more risk items each.

- Stakeholder response to the construction of a new low-level radioactive waste disposal facility is unknown.
- It is anticipated that the environmental assessment will result in a finding of no significant impact.
- Significant experience does not exist for the construction of a nuclear facility using the design build-delivery method.
- There are a limited number of design-build vendors familiar with DOE-related nuclear safety requirements and capable of meeting ASME NQA-1 requirements.
- It is assumed that the waste acceptance criteria are a condition of the disposal authorization statement.

1.3 Justification of Mission Need

The continuing nuclear mission of INL, associated ongoing and planned operations, and Naval spent fuel activities at NRF require continued capability to appropriately dispose of remote-handled LLW. Providing continued disposal capability for remote-handled waste supports DOE-NE's mission "to lead the DOE investment in the development and exploration of advanced nuclear science and technology." Without established, viable remote-handled LLW disposal capability, ongoing and future nuclear energy programs at INL would be adversely impacted because remote-handled LLW disposal options would need to be considered on a program-by-program basis, resulting in increased costs and schedule. The lack of remote-handled LLW disposal capability also may impede DOE's ability to initiate new programs at INL.

Remote-handled LLW disposal capability also is critical to meeting the National Nuclear Security Administration's mission to "provide the United States Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants." All spent nuclear fuel from the Navy's nuclear-powered fleet is sent to NRF for examination, processing, dry storage, and eventual shipment to a permanent geologic repository. A reliable disposal path for remote-handled LLW generated during spent nuclear fuel handling and packaging operations is essential to NRF's continued receipt and processing of Navy spent fuel and, therefore, to the Navy Nuclear Propulsion Program and to national security.

The mission need statement for the INL Remote-Handled LLW Disposal Project, created as a result of evaluating INL-generated LLW disposal options, is as follows:

> *The INL will develop replacement remote-handled low-level waste disposal capability by the end of Fiscal Year 2015 to support cost-effective, efficient operations in support of INL's nuclear energy mission and the Naval Nuclear Propulsion Program. Such disposal capability is required to enhance ongoing Departmental and National mission-based research, defense, and energy programs.*

The project mission need statement (CD-0 approval) was approved by NE-1 on July 1, 2009. Since then, closure of RWMC was extended from 2015 to 2017 and project need date has been extended to 2018.

Completion of this project is critical to the long-term conduct of DOE's missions at INL. Some impacts if the Remote-Handled LLW Disposal Project is not approved are as follows:

- Continued processing of the Navy's spent fuel will be significantly affected once existing interim storage capacity is exhausted, impacting DOE's ability to support the Navy's nuclear-powered fleet
- Processing of spent fuel currently in storage at NRF will be negatively impacted, jeopardizing DOE's ability to comply with terms of the Idaho Settlement Agreement (State of Idaho 1995; State of Idaho 2008)
- Failure to meet the terms of the Idaho Settlement Agreement could result in fines and penalties of up to $60,000 per day and termination of Navy spent fuel receipt at INL (State of Idaho 1995; State of Idaho 2008)
- Continuity of INL mission-critical operations will be at risk
- Operations at ATR will be curtailed once existing interim storage capacity is exhausted
- Future INL nuclear programs that rely on safe, compliant, remote-handled LLW disposal will be in question
- Accumulation of high radiation materials at NRF and ATR will subject workers to increased safety and health risks
- DOE will continue to spend significant resources in identifying alternate remote-handled LLW disposal pathways, interim storage capabilities, and approaches for short-term management of INL's remote-handled LLW waste streams
- DOE and contractor resources will be partially diverted from mission to waste management issues.

In summary, if the replacement remote-handled LLW disposal capability is not established, the long-term viability of INL as the nation's lead nuclear energy laboratory will be adversely affected.

1.4 Project Description

The INL Remote-Handled LLW Disposal Project will pursue development of a new remote-handled LLW disposal facility to provide uninterrupted, remote-handled LLW disposal capability in support of NE and NR missions. A formal DOE decision on how to proceed with the project will be made in accordance with the requirements of NEPA (42 USC§ 4321 et seq.). Remote-handled LLW is generated from nuclear programs conducted at DOE's Idaho Site, including spent nuclear fuel handling and operations at NRF and operations at ATR. Remote-handled LLW also will be generated by new INL programs and from segregation and treatment (as necessary) of remote-handled scrap and waste currently stored in the Radioactive Scrap and Waste Facility at MFC.

The project scope consists of the design and construction of a facility consisting of (1) site infrastructure, (2) a transportation system (comprised of one or more casks and associated handling equipment), and (3) a disposal vault system. The infrastructure will include necessary features to support the disposal vault system, such as a subsurface water drainage system, security and safeguards (e.g., fences and controlled entry equipment), utilities (e.g., electricity, firewater, communications, sewer, and potable water), an administration building, a maintenance building, supporting equipment (e.g., refurbished crane, forklift, truck, radiological monitoring devices, and maintenance equipment), and monitoring wells. For cost estimating purposes, a system (Resource Conservation and Recovery Act-type) liner has been included in the conceptual design. A systems engineering evaluation of engineered features, including liner alternatives will be performed to determine the preferred alternatives. The recommended alternatives will be included in the performance specifications and project baseline prior to CD-2/3.

The conceptual design for the proposed vault system is similar to the remote-handled LLW concrete disposal vaults currently in use in the SDA to accommodate, uninterrupted operations at the generating facilities and to capitalize on operations experience and cost efficiencies of current remote-handled LLW disposal practices.

Vaults will be constructed of precast concrete cylinders (i.e., pipe sections) stacked on end and placed in a honeycomb-type array (see Figure 2). This configuration provides the ability to dispose of remote-handled LLW within the smallest footprint possible. For planning purposes, until such time as a specific INL location is sited for the new disposal facility and the radiological performance assessment is completed, the number of required vaults has been conservatively estimated at 247, assuming that subsurface conditions limit vault configuration to the accommodation of two waste containers in a stacked configuration.

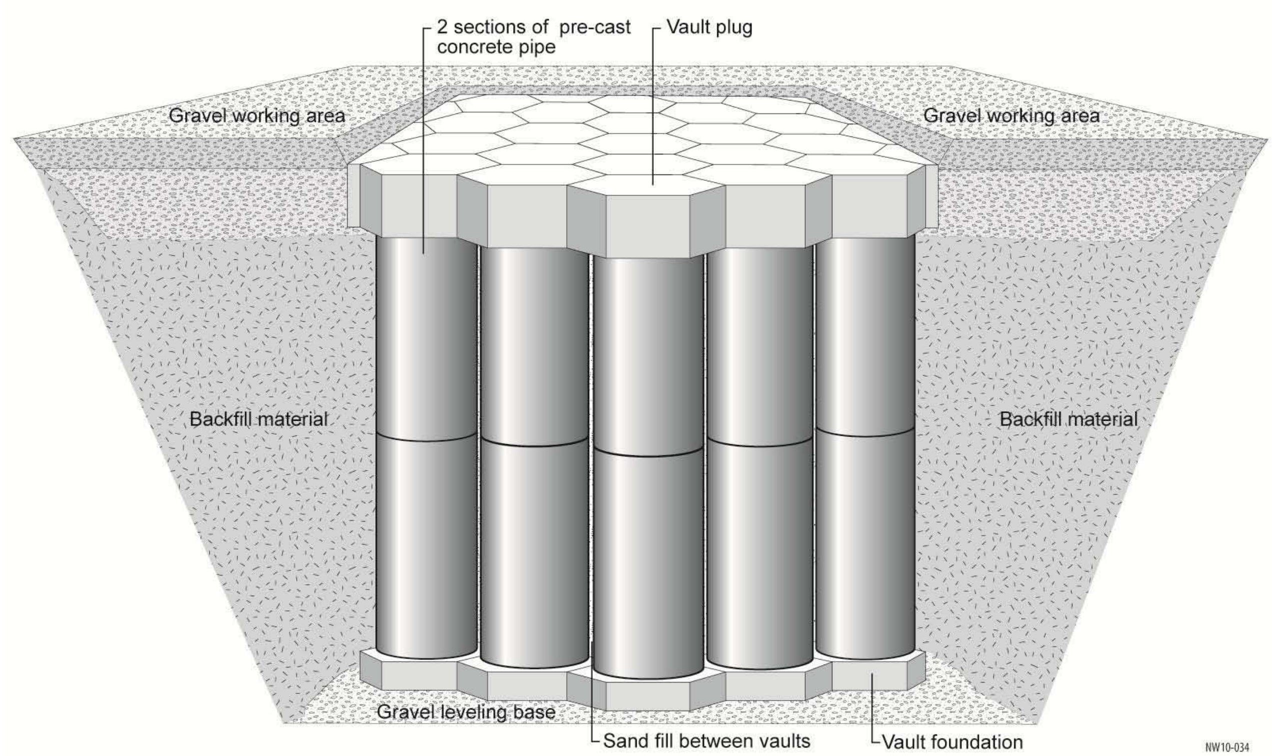


Figure 2. Concrete vault layout.

Three diameter configurations of concrete vaults are currently envisioned for the proposed onsite facility. The first design is based directly on the RWMC vaults, which are suitable for the 55-ton cask waste container used by NRF for transport of remote-handled LLW. Each vault is comprised of two 10-ft sections of precast concrete pipe, stacked on end, for a total interior height that is sufficient to accommodate two waste containers. Each NRF waste container holds approximately 3 m^3 of waste. The required number of this type of vault is determined by the planned shipping schedule from the generator facilities. The projected annual average volume of remote-handled LLW is estimated to be approximately 84 m^3. Of the expected volume, 43 m^3 (comprising all remote-handled LLW activated metals and resins from NRF) will be disposed of in the concrete vaults of this design. This requires eight vaults (16 waste containers) annually. For the assumed 20-year operational period, approximately 160vaults will be required. For planning purposes, 162 vaults were assumed, so the array could be laid out with the same number of vaults in each array row.

The second vault design is based on configurations of the containers used by ATR for transport of remote-handled LLW resins. These vaults will be constructed of two 8-ft precast concrete pipe sections. These vaults are larger in diameter to accommodate the NuPac™ liners (i.e., waste containers) used to transport ATR resin waste. Each vault will hold two liners with each liner holding approximately 6 m^3 of waste resin. The generation rate for the ATR remote-handled LLW resins is expected to be 36 m^3 per year. At this generation rate, three vaults (six liners) of this design will be needed annually. For the assumed 20-year operational period, approximately 60 vaults will be required.

The third vault design is based on the assumed configuration of containers to be used by ATR and other generators, such as MFC, for transport of remote-handled LLW activated metals. It is assumed that each waste container will hold approximately 0.5 m^3 of waste. These vaults are configured similar to the NRF vaults for access and surface configuration. Each vault consists of two 10-ft sections of precast concrete pipe, stacked on end, for a total interior height sufficient to accommodate two waste containers. Waste from new missions and from the processing of MFC waste is expected to generate approximately 2 m^3 (two waste containers) of remote-handled LLW per year. The facility will initially have capacity to support such waste generated over a period of 20 years (approximately 40 waste containers). The ATR remote-handled LLW activated metals will be generated on a periodic basis that is correlated with ATR core internals changeout activities. These activities are expected to generate approximately 3 m^3 of remote-handled LLW activated metal once every 8 years. For planning purposes, it is assumed that waste material from three core internals changeouts will be emplaced during the 20-year operational period of the disposal facility. Therefore, ATR is expected to ship a total of 6 m^3 of remote-handled LLW activated metals that will be packaged in 6 waste containers. For the assumed 20-year operational period, a total 46 waste containers will require 23 vaults of this design. For planning purposes 25 vaults were assumed so the array could be laid out with the same number of vaults in each array row.

In total, approximately 247 vaults of three different designs will be required in the proposed facility to dispose of all remote-handled LLW currently projected to be generated at INL through FY 2037. Initial construction of the facility will be based on current waste generation projects from FY 2018 through FY 2037; however, the proposed design of the facility is such that if additional disposal capacity is required or it is desirable to extend the operational life of the facility, additional vaults can be added.

House Report 109-86 mandates One-for-One Replacement legislation and requires that requested project funding be set aside for the elimination by transfer, sale, or demolition of excess buildings and facilities of equivalent size. Off-setting decontamination and demolition for this project will be conducted during CERCLA remediation of the SDA at RWMC. CERCLA remediation would be funded through the Office of Environmental Management; therefore, offsetting decontamination and demolition costs are not reflected in project funding requirements. The currently planned remote-handled LLW disposal facility will have a total footprint of approximately 5 acres. The SDA at RWMC encompasses 97 acres and remote-handled LLW waste is buried in 1.7 of the 97 acres. Additionally, the proposed facility will have minimal building square footage. Two support structures are required for the proposed facility: an administration building and a maintenance building. Anticipated square footage, based on the conceptual design, of the buildings is 1,900 ft^2 and 4,800 ft^2, respectively. This new square footage also will be offset by elimination of excess square footage from identified footprint reduction activities at INL. INL provides DOE with regular input on asset utilization.

Uncertainties in the project description still exist at this CD-1 stage. These include issues such as funding, legal and regulatory issues, technical and functional requirements, integration and key interfaces, stakeholder issues, and availability of key project and subcontractor resources. These uncertainties are addressed in detail in the acquisition strategy (DOE-ID 2011) and the risk management plan (PLN-2541).

2. MANAGEMENT STRUCTURE AND INTEGRATED PROJECT TEAMS

The Remote-Handled LLW Disposal Project is jointly funded and sponsored by DOE-NE and DOE-NR. A memorandum of agreement was signed by DOE-NE and DOE-NR in June 2009 to establish the funding approach and roles/responsibilities for the project. The Assistant Secretary for Nuclear Energy will serve as the Acquisition Executive for the project, with DOE-NR participating on the Energy Systems Acquisition Advisory Board and concurring on critical decisions related to the project. The Acquisition Executive will appoint a Level 2 Federal Project Director (FPD) upon approval of CD-1. The FPD will provide federal oversight and engage the expertise of an Integrated Project Team (IPT) to effectively manage and execute the project.

The INL management and operating contract requires that Battelle Energy Alliance, LLC develop replacement capability for disposal of LLW generated by INL and other tenets upon closure of RWMC. Consistent with INL contract requirements, BEA will perform project management responsibilities in accordance with DOE Order 413.3B.

2.1 Project Organization

The project organization meets the requirements of DOE Order 413.3B, DOE Order 414.1C, “Quality Assurance,” and the *DOE Idaho Quality Assurance Manual* (IDMS 01.OD.02). The project organization is shown in Figure 3. Functional responsibilities, authorities, and interfaces for key positions shown in the project organization are summarized as follows:

- **Acquisition Executive**: Based on the TPC range, the Assistant Secretary for the Office of Nuclear Energy (NE-1) serves as the Acquisition Executive. In this capacity, NE-1 has responsibility for ensuring adequate project planning and execution and for establishing broad policies and requirements for achieving project goals. The Acquisition Executive performs the following responsibilities:
  - Chairs the Energy Systems Acquisition Advisory Board
  - Approves critical decisions
  - Ensures the FPD is qualified and has the communication and leadership skills necessary to successfully execute the project
  - Approves the acquisition plan, project execution plan, and IPT charter (Appendix A)
  - Provides funding for project development and facility construction and operation
  - Approves Level 1 baseline change requests.
- **Headquarters Program Manager**: NE-32 serves as the Headquarters Program Manager responsible for this project. In this capacity, NE-32 performs the following responsibilities:
  - Provides guidance and resources necessary to execute the project
  - Initiates formal project reviews

- Serves as a point of contact for communicating with other DOE Headquarters offices, including DOE-NR, as necessary to support project execution
- Reviews and approves project budget requests and ensures their integration within the DOE-NE budget submission
- Reviews and provides recommendations to the Acquisition Executive on proposed Level 1 baseline change requests
- Appoints a representative from NE-32 to participate on the IPT
- Reviews and approves all project documents requiring program approval
- Reviews and concurs on project documents requiring Acquisition Executive approval.

- **Site Manager**: The DOE-ID Manager is the senior DOE site official responsible for project execution. The Site Manager performs the following responsibilities:
  - Provides federal personnel and resources at the site necessary to execute the project
  - Nominates the FPD for appointment by the Acquisition Executive
  - Appoints a qualified federal or contractor person from the Idaho site as the designated Design Authority for the project
  - Serves as Chairman of the Energy Systems Acquisition Review Board
  - Reviews and approves critical decision documentation for transmittal to the Headquarters Program Manager for approval
  - Ensures processes and procedures are in place to safely and effectively execute the project
  - Serves as the procurement authority for subcontracts under $50M
  - Conducts regular reviews of project status
  - Serves as the fee-determining official on the INL contract.
- **Assistant Manager, Infrastructure Support**: The DOE-ID Assistant Manager for Infrastructure Support (AMIS) is responsible for management and oversight of the INL infrastructure program and related projects. The AMIS serves as the Contracting Officers' Representative (COR) and all related functions, until approval of CD-2. Upon CD-2 approval, this responsibility will be transferred to the FPD. The Assistant Manager for Infrastructure Support will perform the following functions prior to CD-2.
  - Serves as the COR
  - Approves (in coordination with the Contracting Officer) changes to the approved change control process documented or referenced in the Project Execution Plan
  - Approves Level 2 baseline change requests.
- **Federal Project Director**: Upon CD-2 approval, responsibilities of the Assistant Manager for Infrastructure Support will transfer to the FPD. In addition to these responsibilities, the FPD performs the following responsibilities:
  - Interfaces between federal and contractor staff on all matters relating to the project and its performance
  - Principal point of contact between the project, the AMIS, the Contracting Officer, and the NR Idaho Branch Office
  - Prepares and maintains the IPT charter, ensures the IPT is properly staffed for the stage of project execution, and oversees the roles and responsibilities of each IPT member
  - Coordinates management of project risks and allocation of DOE-held contingency in collaboration with the contracting officers' representative (prior to CD-2)
  - Ensures development and implementation of key project documentation

- Recommends critical decision documentation for approval by the Energy Systems Acquisition Review Board
- Recommends approval of the performance management baseline to the Energy Systems Acquisition Advisory Board Chair and the Acquisition Executive
- Ensures design, construction, environmental, safety, security, health, and quality efforts performed comply with the contract, public law, regulations, and Executive Orders
- Ensures timely, reliable, and accurate integration of contractor performance data into the project's scheduling, accounting, and performance measurement systems, including PARS II
- Evaluates and verifies reported progress and makes projections of progress and identifies trends.

- **Deputy Federal Project Director**: This position is a developmental assignment that includes the following responsibilities:
  - Assists the FPD as requested
  - Fills-in when the FPD is unavailable.
- **INL Project Manager**: The INL Project Manager is the principal point of contact for development and execution of the project within INL. The INL Project Manager performs the following responsibilities:
  - Primary point of contact with the FPD
  - Ensures all necessary activities are identified and integrated into the project baseline
  - Ensures the project is completed within the approved cost, scope, and schedule
  - Ensures effective project management systems, cost controls, and milestone schedules are developed, documented, and implemented to assess project performance
  - Ensures project activities are conducted in a safe and environmentally sound manner
  - Ensures environment, safety, and health and DOE Order 435.1 responsibilities and requirements are performed and integrated into the project
  - Assures compliance with the quality project plan, including, but not limited to, development of quality products and records throughout the life of the project
  - Oversees research and development activities, design, fabrication, installation, construction, and commissioning
  - Represents the project in all interactions with DOE
  - Participates in management meetings with DOE and communicates project status and issues
  - Requests and coordinates internal and external peer reviews of project
  - Chairs the change control board and approves Level 3 change control proposals
  - Prepares and provides recommendations to the FPD for Level 1 and 2 change control proposals
  - Identifies and manages project risks or elevates them to the FPD as needed
  - Chairs the INL IPT.

2.2 Integrated Project Team

The objective of the IPT is to bring together diverse subject matter expertise in order to support successful development and execution of the project. The remote-handled LLW disposal IPT was established at CD-0 and will remain in effect through CD-4. The IPT is chaired by the FPD and organized by functional responsibility. Table 1 presents the functional responsibilities and assignments of IPT members at CD-1. IPT composition will vary based on the project’s requirements as it progresses from formulation through implementation. Consistent with DOE Guide 413.3-18, the IPT has been structured to ensure the ratio of federal to contractor personnel is kept to a reasonable balance. However, IPT meetings are open for all project participants to attend. At CD-1, the INL project manager and INL program manager participate on the IPT. Additional contractor/subcontractor representatives will be included as the project evolves in maturity. IPT roles and responsibilities are described in the IPT charter presented in Appendix A.

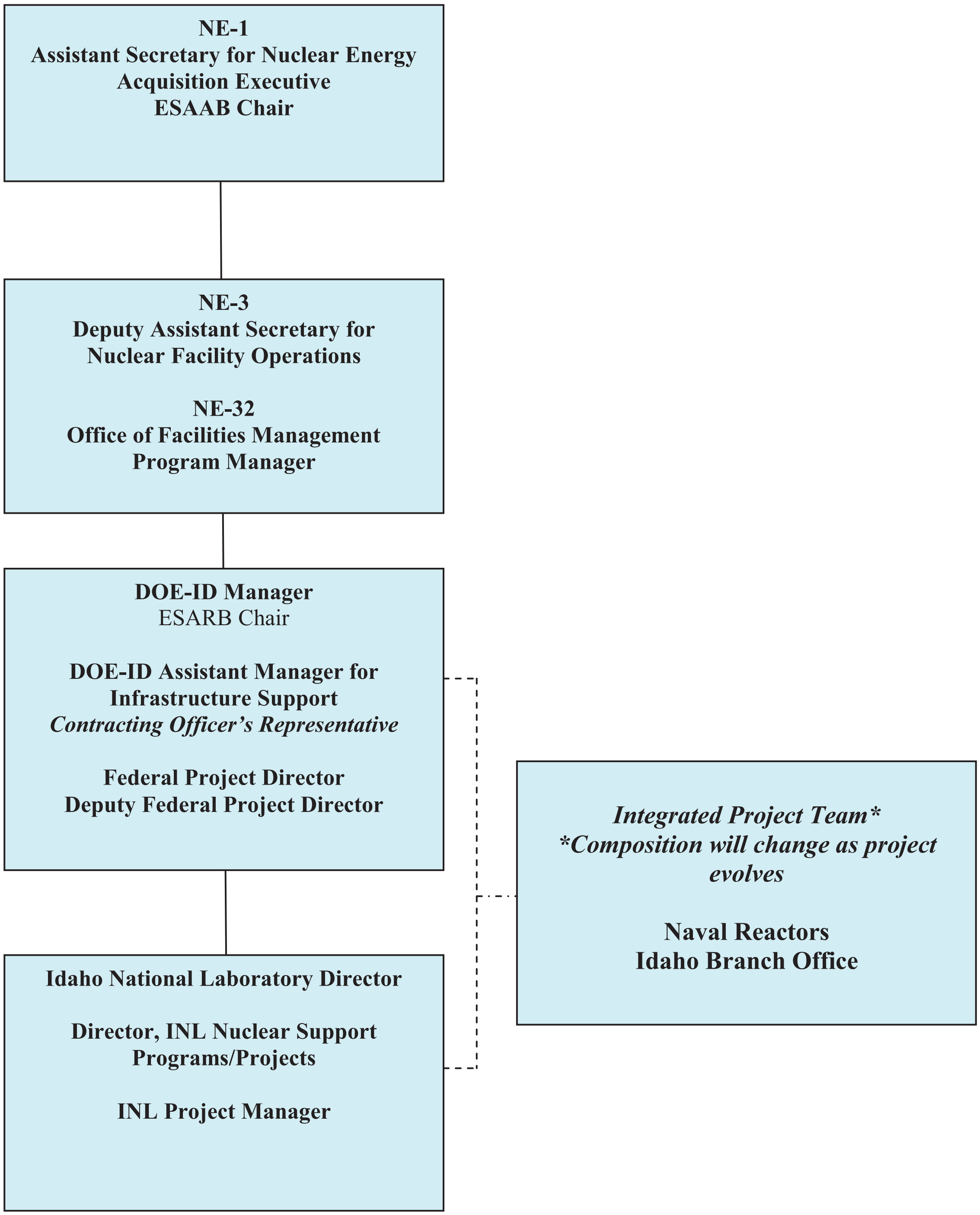


Figure 3. Project organization.

Table 1. Remote-handled low-level waste Integrated Project Team functional responsibilities and assignments.

Representative	Assigned Member	Functional Area of Responsibility
FPD	Julie Conner	Risk Management, Budget, and Baseline
Deputy FPD	Gerardo Islas Rivera	Deputy FPD
NE-32	Kim Petry	PSO – Program Sponsor
NE-PMSO	Mary McCune	PMSO representative
DOE Naval Reactors – IBO	Christopher Henvit	Naval Reactors (Advisory Capacity)
DOE-ID Contracts	Suzette Olson	Contracting Officer
DOE-ID Regulatory	Richard Kauffman	NEPA/Environmental Subject Matter Expert
DOE-ID Communications	Timothy Jackson	Public Affairs and Communications
DOE-ID Budget Services	Faye Alexander	Budgets, Planning, and Project Controls
DOE-ID Nuclear Safety	Charles Maggart	Nuclear Safety Subject Matter Expert
DOE-ID Operational Safety/ Quality Assurance	Donald Armour	Quality Assurance Subject Matter Expert
DOE-ID LLW Federal Review Group Representative	Joel Case	Performance Assessment/ Composite Analysis Subject Matter Expert/ LLW Federal Review Group Interface
DOE-ID Design/Engineering	Greg Bass	Civil Engineer/STSM
DOE-ID Legal	Mike O'Hagen	Legal and Regulatory
INL Project Manager	David Duncan	Battelle Energy Alliance, LLC Project Manager
INL Program Manager	Vincent Tonc	Battelle Energy Alliance, LLC Program Manager

2.3 Idaho National Laboratory Project Organization

Project execution is the responsibility of INL under the guidance of the Assistant Manager for Infrastructure Support prior to CD-2 and the FPD post CD-2. The INL project manager will be responsible for administration and management of all project activities. A project engineer will be assigned and responsible for assisting the project manager with the technical aspects of the project, including management of design requirements, specifications, and drawings. The project manager will be supported by four control account managers, each with responsibilities for managing the work scope within their assigned subprojects, which consists of (1) project documents, (2) infrastructure, (3) vaults, and (4) transportation subprojects. The project manager and control account managers will ensure that appropriate and qualified personnel from INL support organizations are assigned to support project execution. Support organizations include, but are not limited to, planning and financial controls, nuclear safety engineering, safety, quality assurance, environmental compliance, facility operations, procurement, construction management, and engineering. The project manager will interface with the FPD and IPT to ensure project execution is successful. The INL project organization chart is presented in Figure 4.

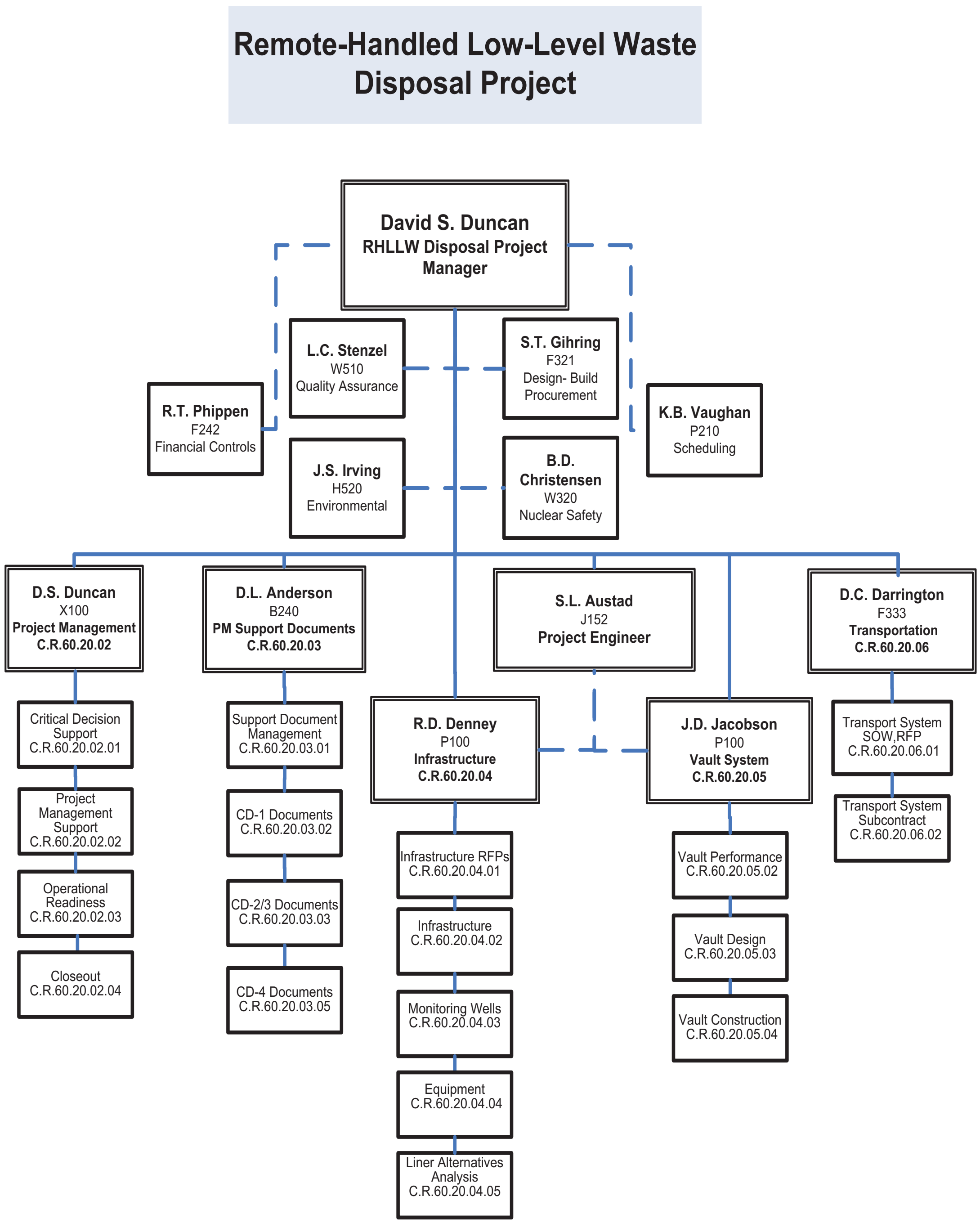


Figure 4. Project internal organization chart.

Project design and construction activities will be completed by subcontractors. Additional subcontractors will be used as necessary to supplement INL resources during project development and execution. Battelle Energy Alliance, LLC has prime responsibility for technical direction and oversight of all contracts required to execute this project.

Because a large percentage of the projected remote-handled LLW to be disposed at the proposed disposal facility will be generated by NRF, close coordination with DOE-NR and the NRF contractor will be required as the project progresses. Support from NRF will be required in providing updated waste volumes, waste characterization data, and other operations-related information necessary to ensure the proposed disposal facility meets the waste disposal needs and requirements of NRF to the maximum extent possible.

3. TAILORING STRATEGY

Based on a DOE-directed, design-build, project delivery approach, the project will utilize key provisions found in the newly revised DOE Order 413.3B to tailor the approach to project execution. Key elements of the tailoring strategy include the following:

1. The performance measurement baseline will not be established until NEPA has been completed; after LLW Federal Review Group review of the performance assessment and composite analysis and issuance of a disposal authorization statement. This tailoring will mitigate project schedule and cost risk and will help to ensure that a performance measurement baseline is established to increase the confidence of the FY 2014 budget request.
2. CD-2 and CD-3 will be combined into a single CD-2/3 approval, and a construction hold point will be added to the schedule to ensure that the design meets all nuclear safety requirements dictated by the Preliminary Documented Safety Analysis prior to the start of construction.
3. The performance measurement baseline, established following completion of advanced conceptual designs by a design-build down-select of potential vendors, will increase the confidence of the FY 2014 budget request and allow for completion of the remainder of the CD-2/3 approval request documents. This tailoring will establish the performance measurement baseline on an advanced conceptual design and firm, fixed-price bid for the design-build contract. A planning baseline will be used to manage the project until the performance baseline is established.
4. Planning packages will be included in the planning baseline. Using the "rolling wave" process, planning packages will be detailed into work packages and incorporated in the baseline prior to execution.

Critical decision support activities will be accomplished using a tailored process to meet the requirements of DOE Order 413.3B. A risk-based methodology and approach will be used to tailor the critical decisions appropriately in consideration of the complexity, cost, and risks of the project (DOE Order 413.3B). This project will use the design-build delivery method to acquire its capital assets. Each critical decision was assessed to determine if or how tailoring would aid in obtaining a particular decision. The following presents each critical decision and extent of tailoring deemed appropriate to achieve decision requirements:

1. CD-0 – Approve Mission Need

   No tailoring needed. All critical decision approval requirements met. CD-0 approval granted on July 2, 2009.

2. CD-1 – Approve Alternative Selection and Cost Range

   No tailoring needed. All critical decision requirements will be met.

To allow request of constructions funds prior to CD-2, the initial budget for the project was established at the upper end of the cost range at CD-1. The request will be included in the FY 2013 budget submission to Congress. This is an optional approach allowed as discussed in DOE Order 413.3B, Appendix A, Paragraph 4.c.(2). This approach to the construction funds request also is presented in the acquisition strategy.

3. CD-2/3 – Approve Performance Baseline/Start of Execution

   Consistent with the design-build delivery method, the CD-2 and CD-3 critical decisions were combined. Capital funds are requested to fund both final design and construction activities.

   The request for capital funds will be made prior to receipt of the CD-2/3 approval and will be requested at the upper bound of the cost range. This will allow award of the design-build contract prior to the receipt of CD-2/3 approval and allow input of the design-build contract value into the performance measurement baseline. For award of the design-build subcontract, the performance specification, and other design-build bridging documents will be submitted in place of preliminary and final designs. All final design work will be completed by the design-builder as part of the design-build subcontract.

   To tailor the project for lack of a separate CD-3 approval, a hold point is added to the schedule to ensure that the design meets all nuclear safety requirements dictated by the preliminary documented safety analysis (PDSA). Completion of the PDSA is normally part of the documentation requirement for CD-3. To tailor this requirement, it is logically connected to completion of final design by the design-builder, which is positioned in the schedule where the CD-3 approval would have been placed. Also attached to the hold point is review and approval of the facility final design by the LLW Federal Review Group, who will verify the design allows the performance objectives of DOE Order 435.1 to be achieved.

4. CD-4 – Approve Start of Operations

   No tailoring needed. All critical decision requirements will be met.

Design and construction of the proposed Remote-Handled LLW Disposal Project will be accomplished using the design-build delivery method outlined in the *Acquisition Strategy for the Idaho National Laboratory Remote-Handled Low-Level Waste Disposal Project* (DOE-IDa). The design-build subcontract(s) for the project will be competitively bid, to qualified subcontractors or subcontractor teams. It will be the responsibility of the selected subcontractor(s) to obtain, as necessary, the services of qualified subtier contractors to participate as project team members. Responses to the request for proposal (RFP) will be evaluated using a "best-value" selection process.

INL will develop a performance specification and an RFP, conduct contract management and overall project management, conduct nuclear safety evaluations and approve appropriate design features, and develop the performance assessment and composite analysis. The design-builder will complete the design and construction of the facility. INL's DOE-approved procurement system, procedures, and processes will be used to support all project acquisition activities. The types of contracts will vary, dependent on the scope of work.

4. INTEGRATED BASELINE

4.1 Scope

The scope of the proposed project, based on the highest-ranked alternative for providing continued, uninterrupted remote-handled LLW disposal capability, is to establish a long-term onsite disposal capability for remote-handled LLW. This capability must be established before closure of the current disposal capability in the SDA remote-handled LLW disposal vaults. Because the total project cost (TPC) to design and build a new remote-handled LLW disposal facility at INL exceeds $20M, the requirements of DOE Order 413.3B are directly applicable to this project.

The Remote-Handled LLW Disposal Project initially will provide disposal capability and capacity to dispose of the estimated quantities of remote-handled LLW projected to be generated at INL between FY 2018 and FY 2037. The conceptual design for the proposed disposal facility is based substantially on the existing design for the SDA remote-handled LLW disposal vaults, which consist of precast concrete cylinders stacked on end in an array. The proposed disposal facility will be designed to do the following:

- Provide a concrete vault disposal system that can accommodate waste containers that are currently being used for disposal of remote-handled LLW generated at NRF
- Provide a concrete vault disposal system that can accommodate waste containers that are anticipated to be used for disposal of remote-handled LLW generated as part of ATR operations
- Provide a concrete vault disposal system that can accommodate waste containers that are anticipated to be used for disposal of remote-handled LLW generated from new INL missions and from processing of co-mingled, remote-handled waste stored in the Radioactive Scrap and Waste Facility at MFC
- Accommodate waste container placement methods currently in use at RWMC, which will maximize continued use of existing remote-handled loading equipment and proven procedures for the NRF shipping cask
- Accommodate unloading of waste containers that are anticipated to be used for remote-handled LLW from other INL generators
- Provide road access that can accommodate anticipated loads from cask transport vehicles without causing damage to the existing infrastructure
- Provide a vault disposal system that provides shielding, minimizes entry of water into the vaults, and allows drainage of any moisture/condensate that accumulates inside the vaults
- Allow access to individual vaults without disturbing adjacent vaults
- Accommodate weight and structure of requisite unloading equipment, including weight of the loaded waste container
- Provide shielding sufficient to reduce radiation levels to the levels specified in 10 CFR 835, “Occupational Radiation Protection”
- Meet performance objectives of DOE Manual 435.1-1, “Radioactive Waste Management Manual.”

Specific requirements, and the basis for each requirement, are identified in the technical and functional requirements document for the project (TFR-483). Additional requirements applicable to the final design and construction of the new disposal facility will be defined in the project performance specification as the project develops. The work scope addressed by this preliminary PEP is defined to be the aggregate of activities specifically related to the proposed line item capital project for establishing replacement remote-handled LLW disposal capability. Specifically, this project addresses the highest ranked alternative to develop a new onsite remote-handled LLW disposal capability at INL to replace the existing capability. Therefore, the project is defined to encompass design, engineering, and other activities that directly support construction and turnover of a disposal facility to operations for the management of INL and tenant-generated remote-handled LLW. This preliminary PEP is not intended to address facility operations that will occur following CD-4.

The conceptual design for the proposed disposal facility is similar to that of the current concrete disposal vaults in the SDA to accommodate uninterrupted operations at the generating facilities and capitalize on operational experience and cost-efficiencies of current INL disposal activities. The proposed disposal facility is planned for design and operation as a Hazard Category 2 nuclear facility in accordance with the project Code of Record (INLf).

Activities defined and controlled by this preliminary PEP commenced with approval of CD-0, will culminate in an operational readiness review or readiness assessment, and will terminate with successful project turnover to facility operations for startup.

4.1.1 Work Breakdown Structure

To effectively implement the scope of work, the project will be organized, managed, and controlled using a work breakdown structure (WBS). This structure is centered around project deliverables to the extent possible and is the framework for establishment of the cost estimate and schedule. Following its development, the project WBS becomes the primary tool used to ensure integrated cost and schedule control. The WBS organizes the scope baseline and provides the hierarchical structure for cost and schedule baseline development. It divides the project into six subprojects and 21 control accounts, as shown in Figure 5. A summary WBS dictionary, provided in Appendix B, presents details of project scope down to the control account level. The WBS will be developed at a lower level of detail by CD-2/3.

The WBS structure is used as the framework for the cost estimate provided in Appendix D. The cost estimate and the schedule are developed at an activity level that rolls up to the control account level shown in Figure 5. The schedule discussed in Section 4.2 and the cost estimate scope referenced in Section 4.3 are organized by the WBS.

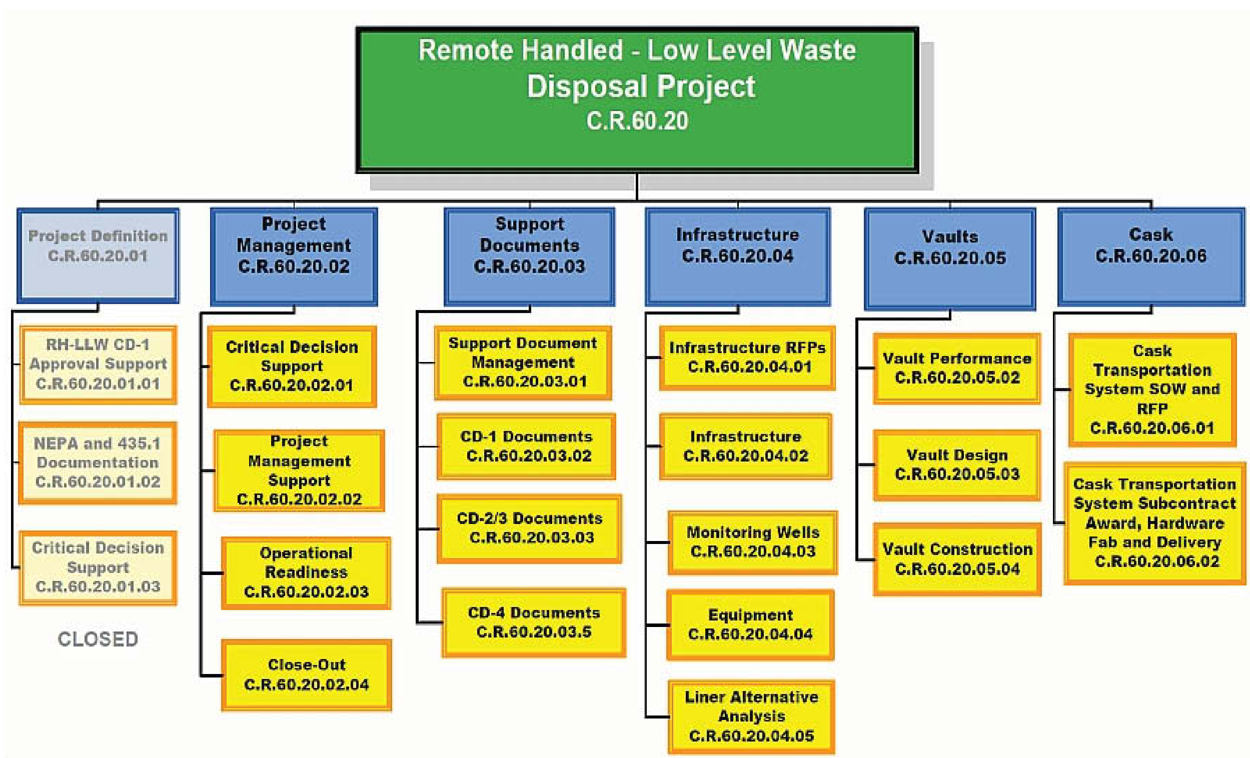


Figure 5. Remote-Handled Low-Level Waste Disposal Project work breakdown structure.

4.2 Schedule

The Remote-Handled LLW Disposal Project Critical Decision milestones are scheduled through FY 2017, as shown in Table 2. The CD milestones support a FY 2017 project completion date. The project mission need statement (CD-0) was approved July 1, 2009. Approval of the project's alternative selection and preliminary cost range (CD-1) is planned for the third quarter of FY 2011. Capital funds are needed in FY 2013 to support final design and to initiate site preparations. Final design is planned to commence upon award of the design-build construction contract and prior to CD-2/3 approval. The schedule includes a hold point to obtain IPT and other appropriate review and approval of the final design when complete in the fourth quarter of FY 2013. Construction will begin in FY 2014 following approval of the Preliminary Documented Safety Analysis and issuance of a Disposal Authorization Statement. Construction of the facility is expected to be completed in the first quarter of FY 2017, with CD-4 being approved in the fourth quarter of FY2017. By adopting this approval sequence, the project is appropriately aligned with DOE Order 413.3B and DOE's budget planning process. Waste disposal operations are planned from October 2017 through September 2037. Closure activities (i.e., design, installation of final cover, and demolition) for the facility will be conducted between FY 2036 and FY 2038 if the operational life of the facility is not extended.

The project milestone schedule is included in Appendix C. This schedule does not include the CD-0 milestone because it has already been completed.

Table 2. Summary schedule for the Remote-Handled Low-Level Waste Disposal Project.

Description	Planned Dates
CD-0, *Approve Mission Need*	07/2009 (actual)
CD-1, *Approve Alternative Selection and Cost Range*	06/2011
CD-2/3, *Approve Performance Baseline and Start of Construction/Execution*	12/2012
Final design complete	08/2013
Approve start of construction (contractor hold point)	05/2014
Construction/fabrication complete	10/2016
CD-4, *Approve Start of Operations*	09/2017

A detailed project schedule, which reflects planning at the control account and work package levels, will be finalized during establishment of the project performance baseline. This schedule and time-phased budget will provide the baseline from which the project earned value will be derived and measured.

4.2.1 Schedule Contingency and Assumptions

Schedule contingency was assigned to higher risk activities where the completion schedule was uncertain. This approach is appropriate for the CD-1 level of planning. For CD-2/3, a Monte-Carlo simulation will be run for the schedule to address schedule contingency and refine its distribution. The assumptions used to establish the schedule for the project are as follows:

1. The receipt of funding to complete the project is based on the 18-month Federal budget cycle, which forms the structure upon which the project schedule is based.
2. Continuing resolution funding is assumed for the first 3 months of each fiscal year, showing new fiscal year funding available after January of each calendar year.
3. Construction funds can be requested prior to receipt of CD-2/3 approval.

4. The critical decision process identified in DOE Order 413.3B is referenced and used to establish major milestones for project execution and around which necessary reviews and document deliverables are based.
5. The design-build delivery method is used to acquire design and construction of the facility.
6. The bid and award of a facility design-build contract, with certain limitations, can be made prior to receipt of CD-2/3 approval.
7. Key project milestones are all necessary critical decisions and the construction hold point identified in the tailoring strategy.
8. The environmental assessment public review period is assumed to be 60 days – 30 days plus 30 days extension.
9. LLW Federal Review Group review of the performance assessment and composite analysis is assumed to require 1 year to complete. A conditional documented safety analysis to be issued within that 1-year period. This is an assumption based on no precedent approval history for a similar facility. This is the first new disposal facility to be reviewed and approved by the LLW Federal Review Group.
10. Critical decision approval requests are assumed to require 6 months for processing.
11. Approval of CD-2/3 requires issuance of the preliminary safety validation report and issuance of a conditional disposal authorization.
12. Clearance to commence construction requires approval of the final design by the LLW Federal Review Group (Final Disposal Authorization) and issuance of an SER supporting completion of the preliminary documented safety analysis.
13. The final documented safety analysis must be completed and approved to receive CD-4 approval.
14. Project closure will occur following receipt of CD-4.

4.3 Cost

The project schedule provides a logical sequence of work activities leading to a milestone, event, or decision point to accomplish project objectives. The planning baseline is the anticipated time-phased, sequence of expenditures required to complete the project work scope. The project schedule is integrated with the planning baseline through resource loading to provide the basis for performance analysis. The planning budget and schedule will be refined as part of the baseline development activities to support establishment of the performance measurement baseline at CD-2/3. An independent project review will be performed prior to CD-2/3 approval.

Project costs associated with a new remote-handled LLW disposal facility include design and construction of infrastructure and monitoring wells; design and construction of vaults; procurement of a cask system for onsite transport of INL-generated, remote-handled LLW; development of the disposal authorization and safety basis documentation; and project management. Operations and maintenance of the facility and facility closure add to project costs to create life-cycle costs.

Estimates used to establish project costs are classified in accordance with the Association for the Advancement of Cost Engineering (AACE) International classification matrix. The intent of this classification is to assist in interpretation of the quality and value of the information available to prepare the cost estimate and accuracy levels that can be produced. A Class 5 estimate indicates the lowest amount of project information quality and value and a Class 1 estimate indicates the highest amount of project information quality and value. Each class has a different set of possible expected accuracy ranges, which define upper and lower bounds for target costs and account for uncertainty in the predicted costs.

Two estimates have been prepared for the project. The first cost estimate includes the project development costs through design, construction, and commissioning of the project. The second cost estimate includes the future operations and maintenance costs and closure of the facility.

The project development cost estimate, provided in Appendix D, is based on the conceptual design report (INLa) and has a target value of $71.8M. It covers project management, development of project documentation, procurement of transportation casks, and design and construction of infrastructure and the vaults.

The project development cost estimate is a Class 3 cost estimate, as defined by AACE. An acceptable expected accuracy range for a Class 3 estimate is from -15% to +20% of the target value. This range has been deemed appropriate for this project at this stage of project development. The upper end of this accuracy range has been used to establish the level of funding requested in the project data sheet. This approach is presented and discussed in Section 4.4. This upper range approach to funding requests will remain in place until the performance measurement baseline is approved at CD-2/3.

The target cost in the project development cost estimate has increased by approximately $14M since CD-0 approval, when the previous rough-order-of-magnitude cost estimate totaled $57.7M. Several additions to the estimate resulted in the net increase. A system liner was added to the vault system at a cost of approximately $6Mand design and construction costs increased by about $3M. Several other changes, both negative and positive, added a total of approximately $5M.

The project development cost estimate includes total estimated cost (TEC) and other project costs (OPC). However, it does not represent TPC, because it does not include DOE-held contingency. TECs are those costs that will be capitalized and apply directly to design and construction of the facility. These costs are funded with line item capital funds. OPCs are those costs that support project completion (such as critical decision support, environmental assessment, disposal authorization, procedure development, training, operational readiness, and facility turnover). These costs are funded with operating funds.

The operations and maintenance cost estimate, provided in Appendix E, has a target value of $112.5M. It covers operations and maintenance during the planned facility life, and closure following operations. Costs to operate and maintain the facility; receive and emplace the waste; and close and configure the facility for the compliance period are included. Operations and maintenance costs were based on cost information for operation and maintenance of the remote-handled LLW disposal vaults in the SDA and include facility monitoring. Costs also are included for operating and maintaining the leachate collection system and evaporation pond that supports engineered subsurface drainage layers in the facility. Closure costs include design and construction of a final cover for the facility and decontamination and decommissioning of all support structures. All costs were developed using FY 2011 dollars and were escalated in accordance with DOE guidance. The operations and maintenance cost estimate has not changed significantly since CD-0. It is a Class 4 cost estimate, as defined by the AACE. The expected accuracy range for this estimate is from -20% to +30% of the target value. This range was established based on AACE recommendations, given the maturity of the estimate and the projected time period over which the estimate spans. It has been used to derive the cost ranges for the total life-cycle cost.

4.3.1 Risk Costs

Risk management for this project is addressed in a separate risk management plan (PLN-2451). Risk items identified are logged and maintained in a "living" risk register database. There are two general categories of risks for the Remote-Handled LLW Disposal Project: internal and external. Internal risks are those that can be managed by the project; external risks are those over which the project has no control. Costs for responding to mitigated internal risks that still occur are addressed through management reserve held and used by Project Management. Costs for responding to mitigated external risks that still occur are addressed through DOE-held contingency.

4.3.1.1 Management Reserve. Management reserve does not increase the overall accuracy of the estimate; however, it does reduce the level of risk associated with its accuracy. Management reserve is intended to cover the inadequacies in the complete project scope definition, estimating methods, and estimating data. Management reserve specifically excludes changes in project scope; work stoppages (e.g., strikes, disasters, and earthquakes); and excessive or unexpected inflation, currency fluctuations, or labor rate changes.

For CD-1, management reserve for each section of the cost estimate was determined by assessing the relative quality of the support information used for that particular section. Each cost element was evaluated and assigned high to low values, which were jury-reviewed by a panel of subject matter experts. The resulting distributions were used to perform a Monte Carlo cost sensitivity analysis using "@Risk" software. The target management reserve for the project development cost estimate, based on cost estimate accuracy, is $8.21M, which is included in the $71.8M cost estimate value. A semi-quantitative approach was used to roughly estimate the potential costs associated with internal risks. Based on the likelihood of occurrence and potential cost, schedule, and technical impacts, each risk item was assessed as high, medium, or low. Risk response costs were assumed to be approximated by the potential cost impacts for those internal risk items that were assessed as being medium or high risk. The results are recorded in the project's risk register. Table 3 shows the internal risks and associated cost impacts contributing to management reserve. The total estimated potential cost to respond to mitigated internal risks that still may occur is $1.82M. This amount is added to the management reserve derived from the project development cost estimate accuracy, discussed above, for a total management reserve of $10.03M.

4.3.1.2 Department of Energy-Held Contingency. Like management reserve, DOE-held contingency also was determined using a semi-quantitative approach to roughly estimate the potential costs associated with risks external to the contract baseline. Based on likelihood of occurrence and potential cost, schedule, and technical impacts, each risk item was assessed as high, medium, or low. The risk response costs were assumed to be approximated by these potential cost impacts for those external risk items that were assessed as being medium or high risk to derive an estimate of the amount of DOE-held contingency. The total recommended DOE-held contingency is the sum of the residual cost impacts if all external risk events occurred. The total amount of contingency recommended for DOE to hold is $5.15M. Table 3 shows the external risks and associated costs recommended for DOE-held contingency. Expected accuracy ranges (upper and lower bounds) are not applied to the contingency.

When the additional risk-based management reserve ($1.82M) is added to the management reserve based on the cost sensitivity analysis ($8.21M), the result is $10.03M in management reserve; and when added to the operations and maintenance cost estimate, the total TEC and OPC is $73.42M. When the DOE-held contingency ($5.15M) is added to the TEC and OPC, the result is the TPC, with a target of approximately $78.57M. When these costs are combined with the operations and closure costs, the result is a total life-cycle cost of $191.05M. When the AACE cost estimate expected accuracy ranges are applied to the target costs, with the exception of historical costs, the result is a TPC ranging from $68.41 to $92.18M and a total life-cycle cost ranging from $158.38 to $238.41. The combination of the two cost estimates, including management reserve and DOE-held contingency, is summarized in Table 4.

Spending profiles were developed from the cost estimates and are used to develop and refine project budgets. Figure 6 represents the projected spending profile or how cost will actually be incurred over time. Costs in the following subsections are based on the spending profiles developed from the two cost estimates.

Table 3. External and internal risks and associated costs – the basis for a recommendation for Department of Energy-held contingency and for project management reserve.

Risk ID	Category	Description	Funding Type	Target Cost[1] ($M)	Risk Type
DOE-Held Contingency for External Risks					
4	Legal and Regulatory	If the environmental assessment does not result in a finding of no significant impact, then an environmental impact statement is required.	OPC	2.50	External DOE-Held Contingency
3, 8, 16	Stakeholder Issues	If there is stakeholder resistance to siting and construction of a remote-handled LLW disposal facility at INL, then a protracted schedule and increased costs, resulting from activities necessary to resolve stakeholder issues, would result.	OPC	2.05	External DOE-Held Contingency
25	Function	If an updated Natural Phenomena Hazard Assessment for the INL site identifies new deficiencies that require design changes, then significant cost and schedule impacts will result.	TEC	0.60	External DOE-Held Contingency
Total DOE-Held Contingency for External Risks				**5.15**	
Management Reserve for Internal Risks					
36	Expertise and Human Resources	If the design/build philosophy requires a vendor to interpret safety basis and quality assurance-related requirements, then issues may not be identified (or not identified early enough) resulting in significant construction rework.	TEC	1.25	Internal Management Reserve
41	Environment, Safety, and Health	If a serious construction injury occurs within the project or on the INL, that results in a work stoppage, then delays to the project could arise, impacting cost and schedule.	TEC	0.57	Internal Management Reserve
Total Management Reserve for Internal Risks				**1.82**	
Management Reserve for Cost Estimate Accuracy					
Cost Sensitivity Analysis	Cost Risk	Management reserve calculated by performing an 85% confidence-level Monte Carlo Analysis on the project cost estimate (9A28-N), based on cost estimate accuracy.	TEC	8.21	Cost Sensitivity Analysis
Total Management Reserve				**10.03**	
			Lower Bound (-15%)	8.52	
			Upper Bound (+20%)	12.04	

1. Residual risk cost impact used to determine management reserve or contingency.

4.3.2 Total Estimated Cost

The project TEC is estimated at $45.66 to $64.46M, with a target of $53.71M (Table 4). TEC includes design and construction of the disposal facility using a design-build delivery method. Included within TEC are all costs associated with the disposal vaults, required facility infrastructure, procurement of a new onsite transport cask, and installation of monitoring wells. TEC also includes INL oversight of the subcontractors, development of final nuclear safety documentation, and project management and reporting during project execution. Figure 6 presents the spending profile at the upper bound, distributing the TEC, OPC, and TPC over the duration of the project (FY 2009 to FY 2017).

Table 4. Cost summary.

Project Cost Summary	($M)		
	Lower Bound[1]	**Target**	**Upper Bound**[1]
TEC[2]	**45.66**	**53.71**	**64.46**
Remote-handled LLW project management	*1.58*	*1.85*	*2.22*
Infrastructure	*30.19*	*35.52*	*42.62*
Vaults	*6.81*	*8.01*	*9.62*
Cask	*7.08*	*8.33*	*10.00*
OPC[2]	**17.60**	**19.71**	**22.57**
Historical costs[3]	*5.51*	*5.51*	*5.51*
Remote-handled LLW project management	*8.24*	*9.68*	*11.63*
Support documents	*2.89*	*3.39*	*4.08*
Infrastructure	*0.60*	*0.71*	*0.85*
Vaults	*0.31*	*0.36*	*0.43*
Cask	*0.05*	*0.06*	*0.07*
TEC + OPC	**63.26**	**73.42**	**87.03**
Management reserve (MR) included above	*8.52*	*10.03*	*12.04*
DOE-Held Contingency	**5.15**	**5.15**	**5.15**
TPC = OPC + TEC + MR + Contingency	**68.41**	**78.57**	**92.18**
Operations and Closure (OPC)[4]	**89.97**	**112.48**	**146.23**
Total Life-Cycle Cost	**158.38**	**191.05**	**238.41**

1. Lower and upper bounds are defined by a range of accuracy prescribed by AACE, based on the class of the cost estimate.

2. OPC and TEC are based on a Class 3 cost estimate, as defined by AACE. The range is from -15% to 20%.

3. OPC historical costs include 2009, 2010, and up through February 2011.

4. Operations and closure costs are based on a Class 4 cost estimate, as defined by AACE. The range is from -20% to 30%.

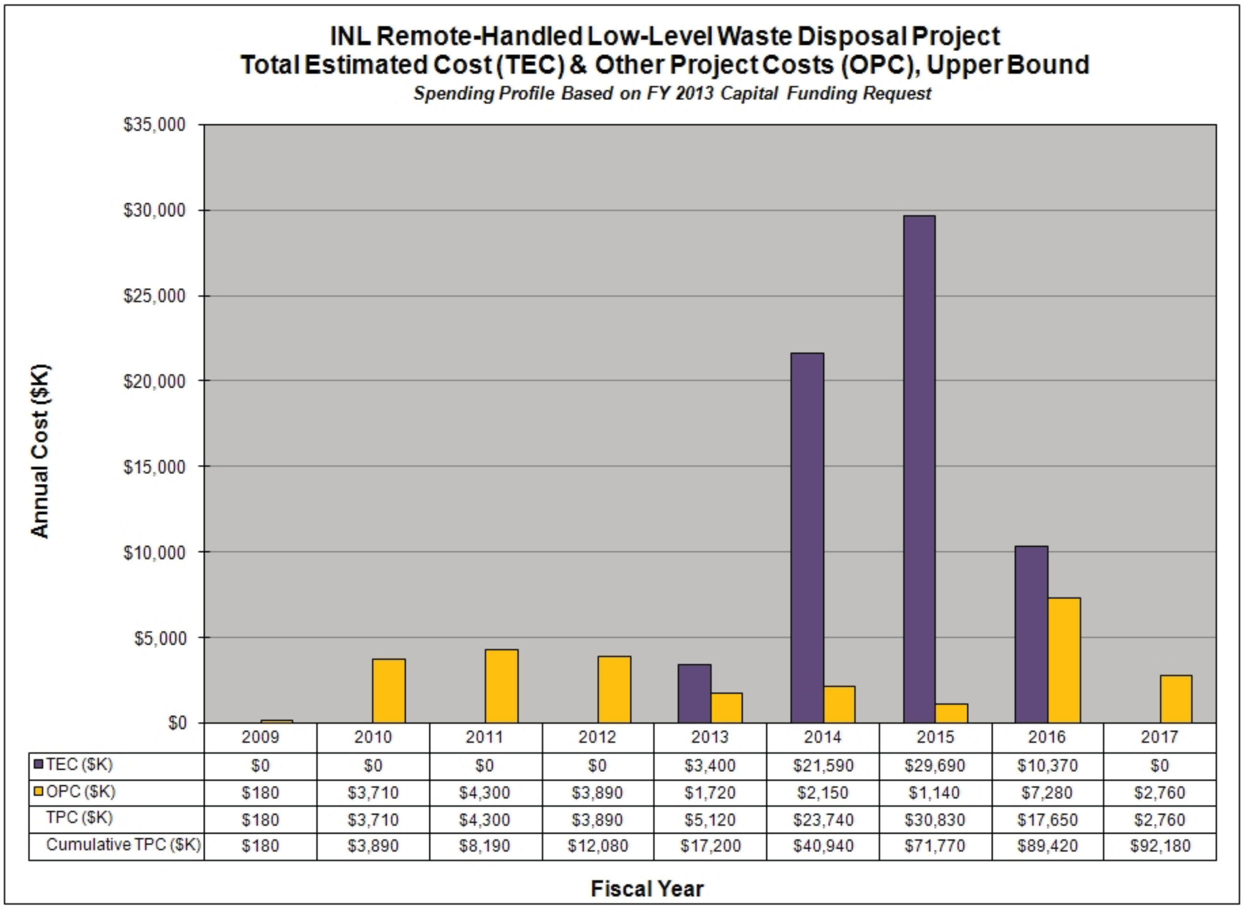
4.3.3 Other Project Costs

OPC is estimated at $17.60 to $22.57M, with a target of $19.71M (Table 4). OPC includes costs associated with development of the project concept; preparation of required NEPA documentation; preparation of safeguards and security documentation; development of the performance specification and RFP for the design-build contract; development of the project performance baseline; development of the radiological performance assessment and composite analysis (and supporting documentation) necessary to obtain a disposal authorization statement per DOE Order 435.1; relocation and refurbishment of equipment from RWMC to the new disposal facility to support operations; development of operations procedures; operations training; completion of the operational readiness review; and obtaining CD-4 approval.

4.3.4 Total Project Cost

TPC totals all project costs, including DOE-held contingency, for all project scope, including facility turnover to operations. TPC is composed of TEC and OPC. TPC includes all project capital and operating costs. TPC for the design, siting, construction, and turnover to operations is estimated at $68.41 to

$92.18M, with a target of $78.57M (Table 4), as shown in the cumulative cost line in Figure 6. This spending profile reflects expenditure of capital funds at the upper bound, starting in FY 2013 and continuing through 2016, to support the execution phase of the project.



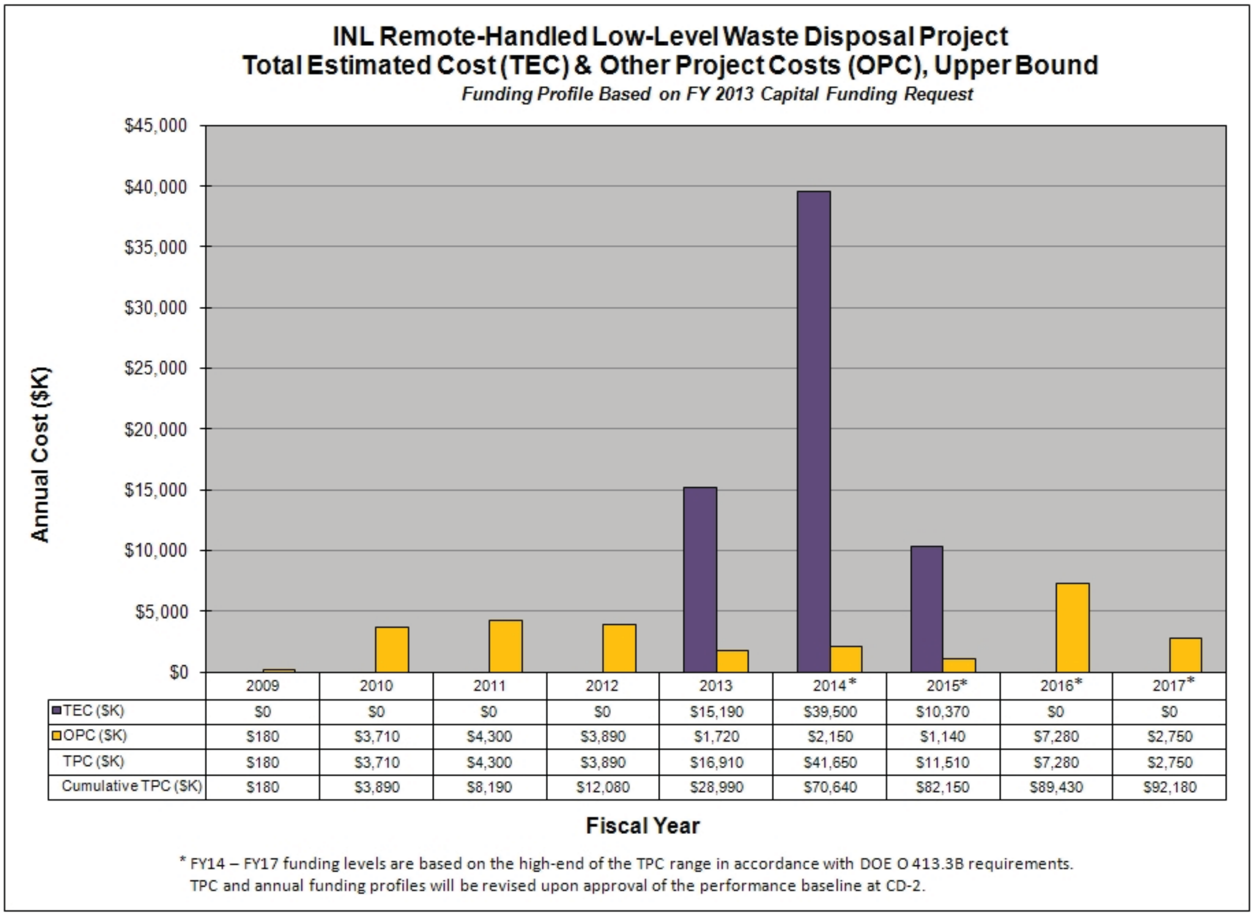
	2009	2010	2011	2012	2013	2014	2015	2016	2017
TEC ($K)	$0	$0	$0	$0	$3,400	$21,590	$29,690	$10,370	$0
OPC ($K)	$180	$3,710	$4,300	$3,890	$1,720	$2,150	$1,140	$7,280	$2,760
TPC ($K)	$180	$3,710	$4,300	$3,890	$5,120	$23,740	$30,830	$17,650	$2,760
Cumulative TPC ($K)	$180	$3,890	$8,190	$12,080	$17,200	$40,940	$71,770	$89,420	$92,180

Figure 6. Total estimated costs and other project costs spending profile (includes DOE-held contingency).

4.4 Funding Profile

The cost estimates also were used to develop a funding profile, which is the basis for funding requests. The distribution of costs in the spending profile differs from the funding profile, because funding must be requested in advance of its planned expenditure. Funding profiles "lead" spending profiles to ensure that sufficient funding is present in the execution year to cover all planned labor and place all subcontracts necessary to execute project scope. Funds required for a subcontract must be present at award. The funding profile ensures that requested funding during each federal budget cycle will be sufficient to cover planned execution year activities.

The funding profile (Figure 7) reflects planned capital funding requirements. The FY 2013 capital funding request represents funding needed to complete the final design of the project and initiate site preparation activities. The FY 2014 request represents funding needed for construction of the vault system and infrastructure. The FY 2015 request represents funds needed to design and fabricate the transportation system. The profile is front-loaded to support the design-build delivery method. If funding profiles are smoothed, TPC will increase as the result of schedule impacts caused by smoothing. All data and graphics in the figure are upper bound values. At CD-2/3 the funding profile will be updated to reflect project design maturity. This profile is requested in the project data sheet.



	2009	2010	2011	2012	2013	2014*	2015*	2016*	2017*
TEC ($K)	$0	$0	$0	$0	$15,190	$39,500	$10,370	$0	$0
OPC ($K)	$180	$3,710	$4,300	$3,890	$1,720	$2,150	$1,140	$7,280	$2,750
TPC ($K)	$180	$3,710	$4,300	$3,890	$16,910	$41,650	$11,510	$7,280	$2,750
Cumulative TPC ($K)	$180	$3,890	$8,190	$12,080	$28,990	$70,640	$82,150	$89,430	$92,180

Figure 7. Total estimated costs and other project costs funding profile (includes DOE-held contingency).

The Principle Deputy Assistant Secretary, DOE-NE, and the Deputy Director, DOE-NR, have agreed to share the cost of the disposal facility, subject to appropriation and availability of funds. Funding shares are based on the percentage of DOE-NE and DOE-NR contributions to the total volume of remote-handled LLW projected for disposal over the facility's 20-year life cycle. An initial cost sharing agreement was established in June 2009, but remains to be finalized, based on current waste volume projections and more refined project costs. The NE/NR annual funding contributions will be renegotiated annually consistent with current project information.

4.5 Life-Cycle Cost

The life-cycle cost for the new disposal facility is the sum of the direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the project. These costs span the design, development, production, operation, maintenance, support, and final disposition of the facility over its anticipated useful life span. Life-cycle cost includes TPC, operations costs during the operational life of the facility (FY 2018 through FY 2037), and costs associated with closure of the disposal facility (FY 2036 through FY 2038). Life-cycle cost is estimated at $158.38 to $238.41M, with a target of $191.05M. Operations costs are estimated at $82.12 to $133.47M, with a target of $102.66M; and closure costs are estimated at $7.85 to $12.76M, with a target of $9.82M.

4.6 Direct, Indirect, and Overhead Rates

In developing the project cost estimate, direct, indirect, and overhead rates are applied to cost elements, as appropriate. These rates are explained as follows:

- **Construction direct costs** are detailed and summarized in the cost estimate detail item reports. Direct costs include material, equipment, and direct construction labor costs. Construction labor rates are in accordance with the INL Site Stabilization Agreement and include payroll, taxes, and insurance. Direct costs also include construction supervision, construction site trailers, trucks, and direct construction support personnel (e.g., non-working supervisors, safety representatives, field engineers, and mechanics).
- **Construction indirect costs** include home office costs, management, accounting, and legal and are included in the overhead markup rate applied to the direct cost total (e.g., labor, material, and equipment). Construction indirect costs also include the contractor profit fee. The profit fee is calculated as a separate markup rate and is applied to the direct costs total.
- **INL direct costs** are the labor, material, and equipment costs expended to perform the identified work scope. The direct labor rates are provided by INL's Planning and Financial Controls organization.
- **INL indirect costs** are included and accounted for in the total burdened labor rate used by INL Cost Estimating in the project estimates. INL Cost Estimating adds an appropriate amount of indirect markup, as provided by INL Planning and Financial Controls, to the direct labor rates. The indirect markup includes organizational adders and general and administrative adders. The resulting labor rate used for estimating purposes includes direct labor rates and the indirect labor markups.

4.7 Performance Measurement Baseline

The integration of the planning, scheduling, budgeting, work authorization, and cost accumulation management processes provides the basis for establishing the performance measurement baseline (PMB). The PMB is the total time-phased budget against which project performance is measured. It is the schedule for expenditure of the resources allocated to accomplish project scope and schedule objectives and is formed by the budgets assigned to control accounts. The PMB also includes budget for future effort assigned as planning packages to WBS levels, plus an undistributed budget. Management reserve is not included in the PMB.

Performance baseline reviews are conducted to ensure that the project baseline is complete, traceable, and reasonable in terms of schedules, milestones, and cost estimates. The reviews ensure that scope is adequately detailed at each stage of the project. The reviews also will ensure that priorities and issues can be identified and key performance criteria can be met. Baseline reviews also assess the acquisition strategy/plan, life-cycle costs, project risks/hazards, and the earned value management system.

Technical, cost, and schedule baselines for the project will be prepared as part of performance baseline development for the CD-2/3 approval request. Once approved, the project will be measured against the PMB. The baselines will be maintained in accordance with INL baseline change control procedures.

4.7.1 Independent Project Reviews and Annual Reviews

As required by DOE Order 413.3B, project reviews will be conducted at critical decision points. Table 5 identifies the key reviews.

Because the TPC is less than $100M, External Independent Reviews are not required. Rather, Independent Project Reviews will be conducted where reviewers from within DOE, but outside the specific project being reviewed, will perform the review. The program manager, may request, authorize, or conduct Independent Project Reviews at any time. For planning purposes, an annual review is assumed each year. Reviews are part of the project management process and are used to assist INL, the FPD, and upper-level management in understanding project plans and verifying that the project will meet the mission need and can be executed within the established performance baseline. Reviews provide information to help make decisions and demonstrate and confirm project accomplishments at various stages. Reviews are an important project activity and will be included in the project baseline schedule.

Table 5. Remote-Handled Low-Level Waste Disposal Project independent reviews.

Critical Decision	Review
CD-1, Approve Alternative Selection and Cost Range	Conceptual Design Review by reviewers external to the project. Independent Project Review to ensure early integration of safety into the design process.
CD-2/3, Approve Performance Baseline/Start of Construction /Execution	Independent Project Review by the Project Management Support Office to validate the performance baseline. Technical independent project review of project design activity up to CD-2/3.
CD-4, Approve Start of Operations	Operational readiness review, with approval of DOE-NE.

4.7.2 Earned Value Management

INL is certifying its earned value management system through the Office of Engineering and Construction Management. This project will be the first to be managed under the certified earned value management system. INL certification activities are planned for FY 2011 and will be completed well in advance of planned project certification activities included in project activities to obtain approval of the PMB. The INL earned value management system will be used to manage the PMB for the project. Activities leading up to development and approval of the PMB also will be monitored and controlled using INL's earned value management system. Cost and schedule performance are updated and analyzed against the PMB on a monthly basis. Work activities are assessed using earned value methods as established in PDD-7002, "Earned Value Management System Description."

Although a control account can potentially have more than one earned value method applied, to the extent feasible, each project control account will be assessed and the appropriate method applied for the type and duration of the activity. The earned value method will be determined in accordance with MCP-7345, "Project Baseline Schedule Development and Management." The following earned value methods will be used, as appropriate, based on the schedule activity type, for discrete efforts:

- Fixed formula—0/100, 50/50, 25/75, where the numerator indicates the accomplishment credit (%) taken at the beginning of the activity and the denominator indicates the credit (% balance) taken at the end of the activity
- Milestone—predetermined percent complete based on internal milestones achieved.
- Percent complete—predefined earning methodology based on detailed steps or hours necessary to complete the task.
- Level-of-effort—performance taken based on scheduled completion. Used where non-task specific support is needed of project and control account managers in reporting, interfaces with stakeholders, and completing other general support activities.

Work progress is assessed monthly to obtain schedule status. Schedule status is the input used to measure progress. Work completed is assessed using the established earned value method. Progress is assessed on all scheduled activities. In addition, a critical path analysis (float analysis included) is performed, as warranted, to ensure the most time-constraining activities are being completed as planned and in the correct sequence. Schedule assessment techniques include monitoring activities that fall on the project critical path, comparing planned durations with actual durations, and comparing planned and forecast dates for activities and milestones. Earned value for the primary design-build construction project will be assessed with an earned value plan established in the subcontract. As part of final subcontract award, this plan will be tied to the subcontractor's payment schedule.

An objective assessment of the project cost and schedule performance will be performed on a monthly basis by comparing the following elements (expressed in terms of dollars):

- *Budgeted Cost for Work Scheduled*—budget calculated from the approved, resource-loaded baseline schedule and is represented in terms of budgeted dollars per month. It represents the estimated value of the work scheduled.
- *Actual Cost of Work Performed*—actual cost charged to the project, plus accruals for work completed, but for which associated payments have not yet been finalized. This information is collected in the INL financial management system.
- *Budgeted Cost for Work Performed*—also known as earned value, it represents progress completed against planned and scheduled work. Earned value is the estimated dollar value of the work performed in relation to the budgeted cost for work scheduled. The earned value is determined from schedule status.

The process of accumulating and comparing performance measurement data results in the identification of favorable (positive) and unfavorable (negative) variances at the control account level. This performance analysis process provides visibility to potential problems, impacts, and alternative courses of action. The variance analysis is documented on the variance analysis report identified in MCP-7348, "Project Data Accumulation, Reporting, and Variance Analysis," if thresholds are exceeded. Variance reporting thresholds for this project are as follows:

Type of Variance	Variance Threshold
Current period schedule	±$10,000 and 10%
Current period cost	±$10,000 and 10%
Cumulative-to-date schedule	±$25,000 and 10%
Cumulative-to-date cost	±$25,000 and 10%
At-completion	±$75,000 and 10%

4.8 Baseline Change Control

The objective of an effective baseline change control process is to provide an orderly and efficient method of incorporating approved changes into the baseline. Project baseline changes require coordination with DOE-ID before initiation and approval before changes are implemented. Baseline changes are controlled in a formal, documented, and auditable process. Changes to the project baseline (i.e., scope, schedule, and budget) and associated funding assignment will be identified, controlled, and managed through INL's formal, documented change control process, as defined in MCP-7400, "Project Baseline Change Management."

Baseline change proposals will be used to provide DOE-ID management, technical personnel, financial personnel, and the contracting officer with a consistent process for baseline change management. Baseline changes may be proposed by the contractor or directed by DOE-ID. However, only the Contracting Officer can authorize changes to the project performance baseline.

As required by DOE Order 413.3B, the change control process will begin after CD-1 for design (i.e., scope/budget/ schedule) and after CD-2 for the PMB. Table 6 identifies the change control thresholds that will be used for this project.

Table 6. Change control thresholds.

Change Type	Line Item Construction Project Summary Baseline Change Control Thresholds*		
	Acquisition Executive **Level 1**	DOE FPD **Level 2**	INL Contractor Project Manager **Level 3**
Scope	A change in scope that 1) affects the ability of the project to satisfy the mission need; 2) impacts the project performance parameters; or 3) changes the funding profile reflected in the project data sheet.	Any change affecting the approved baseline scope that does not affect the mission need or project performance parameters.	Any scope change that does not alter the project baseline.
Schedule	Any changes to 1) a level 1 milestone date or 2) the project completion date.	Any change to a Level 2 milestone, unless the change affects a Level 1 milestone.	Any change to a Level 3 milestone, unless the change affects a Level 1 or 2 milestone.
Cost	Any increase in TPC or TEC.	Changes that 1) authorize the use of DOE-held contingency.**	Changes that 1) increase control account funding but do not affect the TPC or TEC, or 2) authorize the use of contractor-held management reserve.

* The proposed change control thresholds will be effective upon CD-2 approval. The Idaho Facilities Management change control process will be in effect until a project performance baseline is approved by the Acquisition Executive at CD-2.

** In addition to FPD approval, use of DOE-held contingency also requires concurrence of the ESARB.

5. PROJECT MANAGEMENT/OVERSIGHT (STRATEGY)

5.1 Project Management Approach

To accommodate the design-build method used for the project, the critical decision process has been tailored by combination of CD-2 and CD-3 in to a single critical decision. The decisions were combined to facilitate use of the design-build delivery method. The design-build delivery method is justified in the proven technology in the disposal vault design and allows for cost-effective construction of the support infrastructure. In place of a formal CD-3, a hold point at design completion has been established to verify nuclear safety design approval (i.e., the preliminary documented safety analysis) and allow for approval of a disposal authorization statement prior to commencing construction.

The design-build subcontract for the project will be competitively procured and awarded in the first quarter of FY 2013. It will be the responsibility of the selected subcontractor to obtain, as necessary, the services of qualified design, fabrication, and construction companies as subtier contractors. Responses to the RFP will be evaluated using a “best-value” selection process that considers pricing, qualifications, functionality, conformance with established requirements, and past performance.

It is anticipated that smaller subcontracts will be used for certain aspects of the project (e.g., installation of monitoring wells). When outside sources are sought by INL or the design-builder, services will be solicited only from qualified firms via RFP. Dependent on the action, selection will be based on technical merits and price considerations, as provided for in the DOE-approved procurement procedures manual.

The subcontract formation group, comprised of members from support organizations with input into the RFP, will establish the required documents that flow down procedural requirements for inclusion in the RFP. At a minimum, the following support organizations will be involved in development of the procurement packages and evaluation of proposals received in response to the RFP: engineering, quality assurance, procurement, safety, construction management, and nuclear safety engineering.

As the project advances through each phase, certain project management systems, controls, and processes will be used to measure progress and performance. The technical scope, cost baseline, and schedule baseline establish the basis for measurement of project performance. The project performance measurement baseline will consist of the schedule and time-phased budget required to execute the project scope identified in the project data sheet.

The PMB will be established by the project, reviewed by the IPT, and ultimately approved by the Acquisition Executive. The PMB establishes the benchmark by which the project is controlled and performance is measured. The PMB will be used to review how the funds are being managed and whether the project is behind or ahead of schedule. During all project phases, including planning, work must receive authorization from the proper authority. The work authorization is management approval of the expenditure of project resources by a responsible organization to accomplish a specified scope of work within the agreed budget, schedule, and technical objectives. Formal work authorization provides a means for effective internal coordination, communication, and a process to obtain the required management approvals before initiating work. MCP-7344, "Project Work Definition, Assignment, and Authorization," defines the processes, responsibilities, and work authorization documents used by INL for authorizing work on the project.

The DOE FPD, through the DOE Contracting Officer, is responsible for granting authority to perform project work scope for this project. INL prepares the documentation for review by DOE representatives before each CD to support the work authorization process. Upon successful completion of this review, DOE will issue written authorization for INL to perform work consistent with the approved baseline plan.

Once the project work authorization is received from DOE and funding allocations have been made, project work will be performed consistent with the established project schedule and budget. The INL project manager will issue the required project work authorization document(s) to allow work to proceed in accordance with MCP-7344. The work authorization document provides written authorization stating scope, schedule, and budget to performing organizations to execute work.

5.1.1 Project Reporting

The INL reporting system reflects project cost and schedule performance, and tracks changes to the PMB. All costs are collected and reported through the WBS. The system has the capability to report capital costs, operating costs, and estimate-to-completion. The system also provides cost and schedule variance information based on predetermined thresholds at multiple levels of the WBS. The WBS is established, maintained, and controlled through IPS2000 (a web based interface for management reports). The WBS provides the framework for project estimating, scheduling, budgeting, execution, management, and reporting. The INL cost and schedule control tools include hardware and software used to collect, process, and report project funding, budget, schedule, and performance data. Each system addresses a specific project control function. Collectively, these systems provide information and capabilities for the following:

- Developing project schedule and allocating resources
- Establishing cost estimates and PMBs

- Monitoring procurement of subcontracts, equipment, and materials
- Tracking changes to project scope, schedule, and budget
- Monitoring labor hours, costs, and commitments against available funds
- Measuring and reporting project performance
- Monthly Status Reporting in PARS-II

Monthly project reports are prepared in accordance with MCP-7348, "Project Data Accumulation, Reporting, and Variance Analysis." The monthly status report addresses work performed, major accomplishments, status of key milestones, significant issues and their corrective actions, and cost and schedule performance data. The performance reporting will include monthly and cumulative year-to-date cost and schedule variances, along with analysis of those variances. The INL Earned Value Management System will output performance data that can be directly input to the DOE Project Assessment and Reporting System (PARS-II). Qualitative status reporting was initiated in PARS-II at CD-0. Earned Value Management System status reporting in PARS-II will commence at CD-2.

Project performance will be addressed in a formal monthly project review, commencing at the release of capital funding and proceeding through CD-4 approval. Until that time, agreed upon performance reports will be uploaded to the INL access portal for use by the FPD.

5.1.2 Risk Management

A risk management plan (PLN-2541) has been prepared for the project. The plan defines the scope, responsibilities, and methodology for identifying, assessing the impacts of, and managing risks that could affect successful completion of the project. The risk management plan has been prepared in accordance with LWP-7350, "Project Risk Management," DOE Order 413.3B, and DOE Guide 413.3-7, "Risk Management Guide." The plan was initiated to support the CD process and will be modified, as required, throughout the life of the project. The risk register contained in the plan will be revisited periodically by scheduled meetings of the risk management team, where all identified risks will be updated and reevaluated to maintain current consequence and impact analyses. Emerging risks will be added to the register and evaluated for consequence, impact, and planned mitigation strategies. The risk register identifies the potential cost impact (along with the likelihood and potential schedule and technical impacts) for the purpose of assessing (scoring and ranking) the risks as low, medium, or high. The potential cost impacts in the risk register serve as the basis for recommending the DOE-held contingency shown in Table 4. Contingency is the anticipated cost to respond to a potential external risk event if it occurs. It does not include mitigation costs for currently identified external risk items.

The project uncertainties listed in Section 1.2.1 were developed and evaluated as part of the project risk register. They will be revisited and managed as described above.

The project team reviewed and applied the lessons learned from several completed design-build projects at INL, other DOE sites, and private industry. These lessons learned were tabulated and compared to the risks already in the current risk management plan. Many risks associated with the lessons learned had already been addressed; however, four additional risks were identified and have been included in the risk management plan (PLN-2541). See the risk management plan for further details on this review.

5.1.3 Engineering and Technology Readiness

Engineering and technology employed in the design and construction of the remote-handled LLW disposal facility is well understood and has been successfully applied for many years. Neither new, untested technologies nor required technology development is anticipated for its successful completion.

5.1.4 Alternatives Analysis and Selection

An alternatives analysis (INLb) and a siting study (INLc) were performed. Although the preferred alternative is onsite disposal and a preferred onsite location has been identified, the project will not make decisions or take steps that would bias or interfere with the NEPA process. It is understood that the results of the NEPA process could indicate a different site or a different disposal alternative, including offsite disposal, and that any preliminary design work will be undertaken only if the risk is deemed acceptable, when compared with schedule constraints.

The alternatives analysis report (INLb) evaluated the alternatives identified in the mission need statement (DOE-ID 2009). Each alternative was assessed for its viability in providing continued, uninterrupted remote-handled LLW disposal capability. A total of eight possible alternatives were identified to support the mission need, including alternatives that would use existing assets. Since then, no new alternatives have been identified. These alternatives are as follows:

1. Continued disposal at RWMC
2. Disposal at the Idaho Comprehensive Environmental Response, Compensation, and Liability Act Disposal Facility
3. Interim storage
4. Storage for decay
5. Development of an onsite remote-handled LLW disposal facility
6. Offsite remote-handled LLW disposal (multiple locations)
7. Privatization of remote-handled LLW disposal
8. No action.

The approach used to assess the remote-handled LLW management alternatives was two-fold. First, the alternatives were reviewed for their potential to fulfill the mission need for replacement disposal capability through at least the year 2037. Second, alternatives that best met the mission need were evaluated in detail and compared using discriminators of cost, risk, complexity, stakeholder values, and regulatory compliance. The mission need evaluation criteria were as follows:

1. Capacity to accommodate the entire remote-handled LLW inventory
2. Continuous availability of the alternative from 2018 through 2037
3. Effectiveness in achieving disposal in accordance with DOE Order 435.1

With the exception of alternatives 5 and 6, the remaining alternatives did not prove credible in meeting these criteria (Section 3 of the analysis for details).

As identified above, the first step in the evaluation process identified two alternatives that best met the mission need: (1) development of a new onsite disposal facility and (2) disposal offsite at the Nevada National Security Site (formerly known as the Nevada Test Site). These alternatives and how they meet misson need criteria are summarized as follows:

- Alternative 5 (Construct a new onsite remote-handled LLW disposal facility). Onsite disposal of INL and tenant-generated remote-handled LLW requires a disposal facility with below-grade waste disposal vaults, an additional unlicensed transportation cask and handling equipment, and sufficient infrastructure (e.g., crane, forklift, and truck) to handle and execute disposal operations. This alternative would use transportation and handling equipment previously established for past NRF and select ATR Complex disposal operations. The additional cask would handle the remaining configurations planned for disposal at the facility.

- Alternative 6 (Ship all remote-handled LLW to the Nevada National Security Site for disposal). Significant appropriate equipment and systems to transport the waste stream in regular over-the-road shipments would be required to support this alternative. This equipment includes multiple, licensed transportation casks, associated handling equipment, and needed transportation vehicles. The infrastructure at source and destinations ends would require significant modification and enhancement (e.g., at NRF modification needed to allow for higher production loading and at the destination modifications needed to allow for shielded burial operations).

  To allow for offsite shipment, the allowed payload for each shipment would be smaller, requiring a significant increase in the number of required shipments.

5.1.5 Benefits of the Proposed Alternative

The proposed alternative is the design, construction, and operation of a new onsite remote-handled LLW disposal facility (i.e., onsite disposal). Through its establishment, risks associated with transport of highly radioactive waste would be reduced, life-cycle waste management costs would be minimized, and the necessary waste management infrastructure to support ongoing and future DOE-NE and DOE-NR programs would be maintained. Development of this facility would yield the following benefits:

- Provide for uninterrupted remote-handled LLW disposal capability, thereby minimizing potential impacts on INL and NRF operations
- Allow for continued processing of Navy fuels at NRF, enabling compliance with the Idaho Settlement Agreement commitments
- Eliminate the need for significant capital investment in major infrastructure modifications to support offsite disposal of remote-handled LLW, including, but not limited to, acquisition of a Nuclear Regulatory Commission-licensed, Department of Transportation-compliant cask system(s) for offsite transportation; facility infrastructure modifications to support the new transport system(s); and expansion of onsite interim storage capabilities to address offsite shipment campaigns
- Provide for remote-handled LLW management and disposal consistent with DOE Order 435.1.
- Decrease risks associated with offsite transport of waste
- Maintain DOE control of remote-handled LLW disposal and decrease the potential for diversion or sabotage of waste
- Provide a consistent, sitewide waste management system, reducing required coordination among multiple programs to identify and implement cost-effective waste management options
- Reduce dependence on cooperation of third parties, such as disposal site operators, states other than Idaho (shipment and disposal), and other federal agencies (e.g., Nuclear Regulatory Commission for cask certification)
- Provide the most cost-effective approach for management of remote-handled LLW, minimizing life-cycle costs to DOE.

A formal DOE decision as how to proceed with the project will be made in accordance with the requirements of NEPA (42 USC§ 4321 et seq.). Preferred locations for the proposed onsite disposal facility have been identified as part of a siting study (INL 2010c) and have been included in the environmental assessment. The site with the highest score will be included as part of the NEPA process should DOE make a decision to build the proposed onsite disposal facility.

5.1.6 Environment, Safety, and Health

As the prime INL contractor, BEA is required to meet the requirements of 10 CFR 851, "Worker Safety and Health Program." INL has established a DOE-approved Worker Safety and Health Program to reduce or prevent occupational injuries, illnesses, and accidental losses by providing DOE contractors and their workers with safe and healthful workplaces. INL's Worker Safety and Health Program is comprised of multiple documents contained in Manual 14C. The program is a high-level overview, implemented primarily through numerous existing procedures that address safety in the workplace and safe performance of work activities. All INL employees and subcontractors are expected to work under appropriate procedures.

In addition, a construction project safety and health plan will be prepared and submitted to DOE-ID for approval with the CD-2/3 approval request. Safety and health protection during construction will be in accordance with the requirements of 29 CFR Part 1926, "Safety and Health Regulations for Construction;" applicable sections of 29 CFR 1910, "Occupational Safety and Health Standards;" construction management subcontract documents, and INL's Integrated Safety Management System. All work at INL will be conducted in accordance with INL's DOE-approved Integrated Safety Management System. The objective of the Integrated Safety Management System is to provide a safe workplace to perform work while protecting the worker, the public, and the environment by incorporating safety into management and work practices at all levels and by addressing all types of work and all types of hazards. "Safety" encompasses safety and health, quality assurance, and the environment, including pollution prevention and waste minimization.

Construction activities will be covered under a task-specific job safety analysis, which will be approved by construction management. The project supports stop work authority and all team members, whether INL employees or subcontractors, have the responsibility and authority to initiate stop work for any environmental, safety, or quality issue.

A NEPA compliance strategy (INLd), which defines how the requirements of NEPA will be met, has been prepared as part of the CD-1 approval request. The NEPA compliance strategy provides an outline and basis for the environmental assessment, which will formally identify DOE's preferred alternative and location. At that point, the public will be invited to participate in evaluating the selected alternative and location. A public involvement plan (PLN-3378) has been developed to direct review of the environmental assessment by stakeholders.

In addition to compliance with NEPA, construction of a new Remote-Handled LLW Disposal Project facility must comply with environmental laws and regulations and, as such, may require completion of a permit-to-construct under the Clean Air Act. An Air Permit Applicability Determination will be completed to determine the need. If the selected location for the proposed disposal facility is within the storm water corridor, the project also must comply with the National Pollutant Discharge Elimination System general permit requirement. Because the proposed facility is not to be used for disposal of hazardous waste, a Resource Conservation and Recovery Act permit is not required.

All radioactive waste management activities at DOE facilities are governed by DOE Order 435.1. The objective of this order is to ensure that all DOE radioactive waste is managed in a manner that is protective of worker and public health, safety, and the environment. The order requires that all radioactive waste be managed in accordance with the requirements of DOE Manual 435.1-1. As a LLW disposal facility, the remote-handled LLW disposal facility must be sited, designed, operated, maintained, and closed so that a reasonable expectation exists that the specified performance objectives will be met. Compliance with the requirements of the order is demonstrated via the radiological performance assessment, composite analysis, closure plan, and monitoring plan. To assist in ensuring the design complies with order requirements, a liner alternatives analysis will be completed to identify specific facility design requirements that may be needed to meet performance requirements.

This documentation is reviewed by the LLW Federal Review Group and a disposal authorization statement must be issued before construction of the facility commences. Figure 8 depicts the interaction of required NEPA documentation and DOE Order 435.1 documentation in the CD process for a design-build acquisition strategy. All project activities will comply with LWP-8000, "Environmental Instructions for Facilities, Processes, Materials and Equipment."

In accordance with Executive Orders 13423 and 13514, the project will conduct its environmental, transportation, and energy-related activities in an economically sound, efficient, and environmentally sustainable manner. As a management system is developed to support remote-handled LLW disposal facility operations, it will include consideration for planning, environmental policy, performance, objectives, and targets, in accordance with ISO 14001. Construction activities will be conducted in accordance with LWP-7201, "INL Construction," which establishes a minimum set of controls for all construction with application of a risk-based, graded approach to establish greater control and rigor where needed.

5.1.6.1 Integrated Safety Management. All personnel on the project, whether direct hire or subcontract, are expected to participate in achieving a goal of performing work in a safe, compliant, and environmentally responsible manner, and to actively care for their safety and the safety of others. All employees have the obligation to stop work at any time if an unsafe work condition is identified as directed in LWP-14002, "Time Out and Stop Work Authority" for BEA personnel and RD-1003, "General Information and Requirements" for subcontractors. The project manager and first line supervision will be notified immediately if a stop work is initiated. Efforts will be directed to immediately correct any unsafe condition.

5.1.6.2 Industrial Safety and Occupational Health. Industrial safety and health protection during field work activities will be in accordance with the requirements identified in Battelle Energy Alliance Laboratory-wide Manuals 14A, Vol. I and II, "Safety, Fire Protection, and Industrial Hygiene," for work performed by Battelle Energy Alliance personnel or the INL Subcontractor Requirements Manual for work performed by a subcontractor. These manuals incorporate requirements from 29 CFR 1910, 29 CFR 1926, and other contractually required standards. Work activities will be directed through work documents and approved by safety and health professionals that will identify associated work hazards and required mitigation, as required by LWP-6200, "Maintenance Integrated Work Control Process," for Battelle Energy Alliance work activities and RD-2000, "Work Coordination and Hazard Control," for subcontractors. A stand-alone health and safety plan is not anticipated.

5.1.6.3 Nuclear Safety. In accordance with the requirements of DOE Order 413.3B, safety must be integrated into the design process for new or major modifications to DOE Hazard Category 1, 2, and 3 nuclear facilities. The intended purpose of this requirement involves the handling of hazardous materials, both radiological and chemical, in a way that provides adequate protection to the public, workers, and the environment. Requirements provided in DOE Order 413.3B, 10 CFR 830, and DOE Order 420.1B, "Facility Safety," and the expectations of DOE-STD-1189-2008 provide for identification of hazards early in the project and use of an integrated team approach to design safety into the facility. The basic safety-in-design precepts are as follows:

- Appropriate and reasonably conservative safety structures, systems, and components are selected early in the project designs
- Project cost estimates include these structures, systems, and components
- Project risks associated with selections of safety structures, systems, and components are specified for informed risk decision making by the project approval authorities.

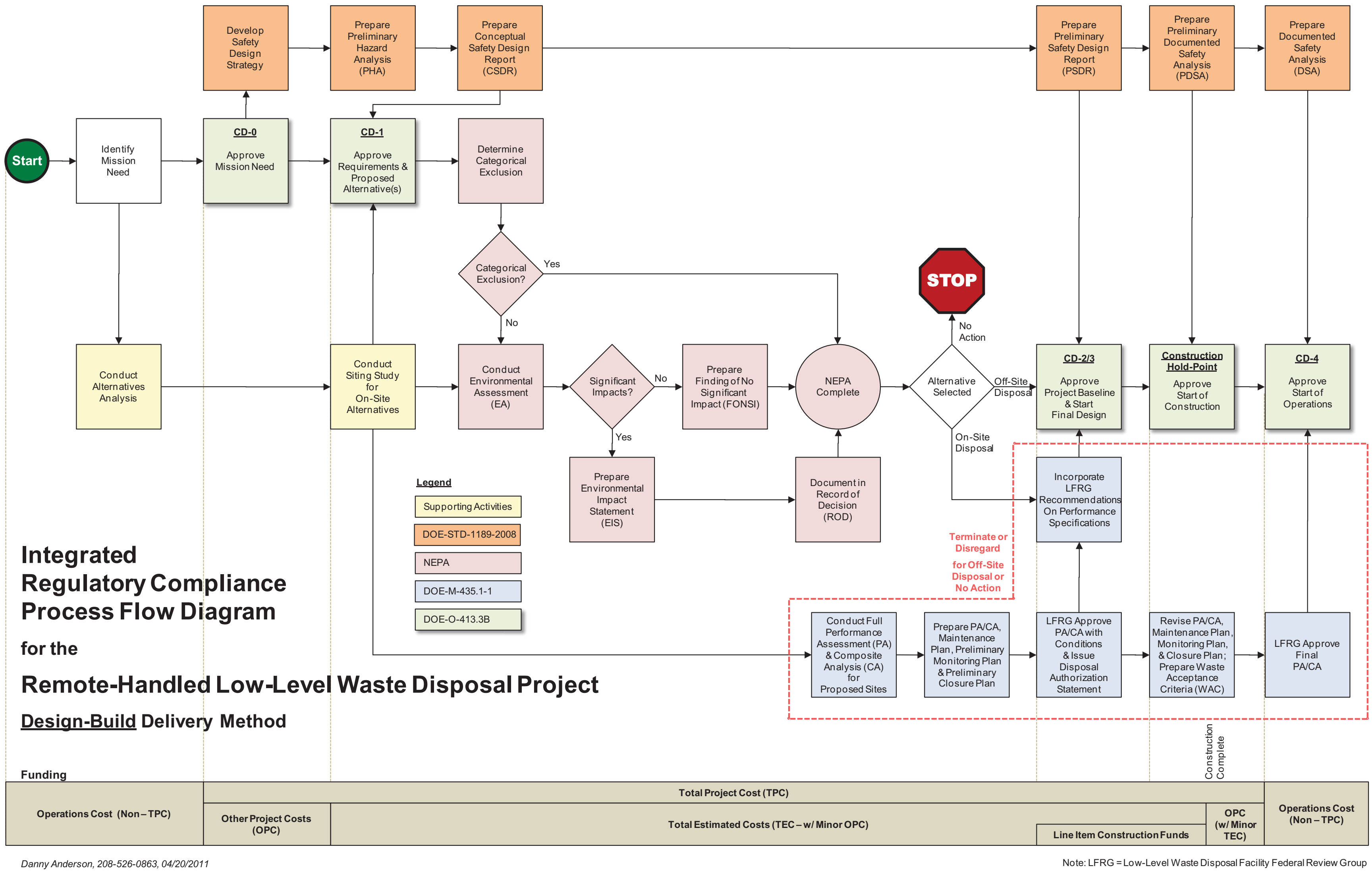


Figure 8. Idaho interaction of required National Environmental Policy Act documentation and DOE Order 435.1 documentation in the critical decision process.

The provisions of DOE-STD-1189-2008, when implemented in conjunction with DOE Order 413.3B and its guidance documents, are consistent with the core functions and guiding principles of the Integrated Safety Management System, as described in DOE Policy 450.4, "Integrated Safety Management Policy."

5.1.6.4 Hazard Analysis. A preliminary hazards analysis (INLe) has been performed to support development of the Remote-Handled LLW Disposal Project. This document is the first in a prescribed development of safety-related documentation of the project.

5.1.6.5 Value Engineering and Management. Value engineering techniques will be used in all phases of the project to achieve the lowest life-cycle cost to accomplish the project technical and functional requirements. Value engineering is a formal method of evaluating alternatives to ensure optimum value. In development of the conceptual design, a number of alternatives to achieve project goals were considered. In all cases, minimizing project cost (both near-term and life-cycle) while meeting project requirements was a primary discriminator in selecting the path forward. For example this, process will be used to refine and detail design requirements that roll down to the performance specification from the technical and functional requirements. Value engineering will be used throughout the project life cycle, as applicable and necessary, to guide decisions to optimize sub-functions and sub-processes. Because the design is closely modeled on the existing INL disposal capability and practices, use of value engineering in this project will in large part build on this practical experience and lessons learned from current operations.

5.1.7 Safeguards and Security

The project is tentatively planned to be located within geographic areas designated for asset protection. Because of its potential location, a preliminary security vulnerability assessment was performed by INL Security and Emergency Services. This document (INL/INT-11-21259) is classified as "Official Use Only" and is available for review and use as needed. This assessment evaluates the proposed facility and recommends protection strategy and requirements to ensure proper protection of the waste material.

5.1.8 Configuration Management

Configuration management provides identification and documentation of the configuration of the end products and controlling changes to the configuration during the life cycle. For the remote-handled LLW disposal project, configuration management will include identifying, allocating, and managing requirements; establishing and maintaining facilities configuration information; and managing work control and change control. In the early stages of the project, configuration management will be conducted in accordance with LRD-10501, "Configuration Management Requirements." Prior to CD-2/3, if it is determined that detailed configuration management plans are required, they will be developed and included in a revision to this PEP or as a stand-alone configuration management plan. No software will be developed as part of this project; therefore, there is no need for software configuration management. Configuration management will be applied only to hardware (facilities and equipment). Documentation is covered under Section 5.1.9.

5.1.9 Records Management/Document Control

A project records and controlled documents system will be established for the project. A formal project file and document control system that preserves and controls project records will be maintained. The system will comply with LWP-1202, "Records Management." Additional records management requirements defined in LWP-7201 will be addressed during the construction phase of the project. Uniform file codes, disposition authority, and retention periods will be established. Document configuration control will be conducted in accordance with LWP-1201, "Document Management."

5.1.10 Systems Engineering

A decision was made, in coordination between DOE and INL project management, that a systems engineering management plan was not required for this project. Nevertheless, systems engineering principles have been and will continue to be applied. A certified systems engineering professional is assigned to the project, on a full-time basis, to assist with requirements identification and management, risk management, interface control, and integration.

5.1.11 Quality Assurance

The primary quality assurance objective is to ensure that the project operates in a safe, secure, and environmentally conscientious manner. INL has implemented a DOE-approved quality assurance program (Manual 13A) designed to comply with DOE Order 414.1C and 10 CFR Part 830, Subpart A, "Quality Assurance Requirements." The quality assurance plan also addresses requirements of ASME NQA-1-2000, "Quality Assurance Requirements for Nuclear Facility Applications," and DOE/RW-0333P, "Quality Assurance Requirements and Descriptions" (DOE 2004).

The project Quality Assurance Program Plan (PLN-3359) provides documentation of the procedures and processes used for assuring the quality of products and services in support of the project. A graded approach will be applied for quality assurance through the assignment of quality levels to items and activities at the earliest time consistent with the application of appropriate controls. Quality engineering will be responsible for defining the quality level(s) of the project work scope. The quality engineer will aid in development of the required subcontract procurement packages and prepare surveillance plans to monitor subcontractor-performed tests and inspections. The engineer will ensure required surveillances are performed and will coordinate all work with construction management. Facility quality engineering and system engineering will define quality processes that must be in place to comply with the safety basis documentation for the Hazard Category 2 nuclear facility.

5.1.12 Communications Management Plan

A public involvement plan (PLN-3378) has been developed to address how the public and other stakeholders will be kept informed of progress on the project. This plan will serve as the communications management plan and has been developed in coordination with DOE-ID Communications staff.

5.1.13 Testing and Evaluation

In this project, testing and evaluation activities primarily focus on verification that the facility meets all design requirements and to support safe operation as a nuclear facility. These areas of focus are as follows:

1. Quality control inspection of construction activities. For infrastructure construction and vault installation, quality inspection plans will be developed to ensure that construction materials and workmanship meet design requirements.
2. Functional testing of all operational systems necessary to support use of the facility, including, but not limited to, water, septic, electrical, and security systems.
3. Materials verification, assembly, and fit-up of vault components. Quality inspection of the vault system will occur to ensure that all safety design requirements are implemented.
4. All software used to analyze and verify facility design performance will meet quality requirements established in the Quality Assurance Program Plan.

5.1.14 Project Reviews

Internal project status reviews may be conducted at any management level within the project, but will primarily be held by INL and the DOE-ID FPD. Status reviews between INL and the DOE-ID FPD will be held at least monthly (more frequently if determined necessary) to provide for discussion of project technical, cost, and schedule progress; performance trends; specific variances to project WBS activities; other issues; and recovery plans implemented to avoid project slips or delays.

Formal project reviews that use the Project Definition Rating Index will be completed prior to CD-2/3 and CD-4 approvals.

5.1.15 Transition to Operations

Turnover and acceptance planning begins during the conceptual design phase and is finalized during the project execution phase. Turnover and acceptance activities are considered OPC and include facility operating procedures development, functional testing, operations personnel training, spare parts procurement, operational readiness review activities, and facility turnover. A significant amount of the turnover and acceptance work will begin before construction completion such that testing and training can be initiated after physical completion and partial turnovers of the facilities from the construction subcontractor to Battelle Energy Alliance, LLC. The activities will conclude with the project turnover review committee report and final facilities transfer to the facility manager. Project turnover and acceptance will be conducted in accordance with LWP-7460, "Project Turnover and Acceptance."

An operational readiness review/management self assessment determination will be completed per LWP-9903, "Performing Management Self-Assessments for Readiness," and in accordance with DOE Order 425.1C, "Startup and Restart of Nuclear Facilities." This determination will be made with the approval of BEA management and on the recommendation of the PSO, who is responsible for authorizing startup of Hazard Category 2 Nuclear Facilities. Project turnover and assessment activities will be coordinated to support obtaining CD-4 approval.

5.1.16 Project Closeout

Following completion of acceptance activities, a project completion report will be issued. The report will describe or reference any follow-on commitments and requirements (i.e., post project). A checklist of closeout activities will be prepared and a schedule to complete project closeout (physically, contractually, and financially) within 6 months after the data of the final project transfer will be established. A closure plan and a maintenance plan will be written. A formal transfer of all documents, materials, equipment, manpower, and responsibilities will be completed during project closure. The project team will support the DOE FPD in obtaining CD-4 authorization. Financial data will be provided to DOE to support preparation of the "Prior Years Construction Report" until the project is financially closed. Final project closure will include development of lessons learned.

6. REFERENCES

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10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, Office of the Federal Register.

10 CFR 851, "Worker Safety and Health Program," *Code of Federal Regulations*, Office of the Federal Register.

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Executive Order 13423, “Strengthening Federal Environmental, Energy, and Transportation Management,” January 24, 2007.

Executive Order 13514, “Federal Leadership in Environmental, Energy, and Economic Performance,” October 5, 2009.

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INLa, *Conceptual Design Report for the Remote-Handled Low-Level Waste Disposal Project*, INL/EXT-07-12901, Idaho National Laboratory.

INLb, *Alternative Analysis for the Remote-Handled Low-Level Waste Disposal Facility*, INL/EXT-09-17152, Idaho National Laboratory.

INLc, *Siting Study for the Remote-Handled Low-Level Waste Disposal Facility*, INL/EXT-07-12092, Idaho National Laboratory.

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