federal laws and regulations; and meet other obligations such as the Hanford Federal Facility Agreement and Consent Order (also referred to as the Tri-Party Agreement, or TPA) (Ecology et al. 1989).

To address anticipated needs for waste management capabilities, DOE proposes to do the following:

- continue to operate existing treatment, storage, and disposal facilities for LLW and MLLW, and treatment and storage facilities for TRU waste
- construct additional disposal capacity for LLW
- develop capabilities to treat MLLW
- construct additional disposal capacity for MLLW
- construct disposal capacity for ILAW and WTP melters
- close onsite disposal facilities and provide for post-closure stewardship of disposal sites
- develop additional capabilities to certify TRU waste for disposal at WIPP.

Alternatives proposed to accomplish the purpose and need are described in Section 3. The No Action Alternative is also evaluated as required by NEPA. For purposes of analysis in this HSW EIS, the No Action Alternative is defined as continuing ongoing activities, or as implementing previous NEPA decisions where those activities have not commenced.

1.3 Overview of Hanford Site Operations and DOE Waste Management Activities

The Hanford Site occupies approximately 1517 km^2 (586 mi^2), principally in Benton and Franklin counties of south-central Washington state (Figure 1.1). The Columbia River flows through the northern and eastern parts of the site, which extends about 46 km (25 mi) north from Richland, Washington.

DOE and its predecessors, the Manhattan Project, the U.S. Atomic Energy Commission (AEC), and the U.S. Energy Research and Development Administration (ERDA), have operated the Hanford Site since the 1940s. From the beginning through the 1980s, the primary mission at Hanford was to produce nuclear materials in support of United States defense, research, and biomedical programs. Operations associated with those programs used facilities for fabrication of nuclear reactor fuel, reactors for nuclear materials production, chemical separation plants, nuclear material processing facilities, research laboratories, and waste management facilities. Plutonium production at Hanford has ceased, and DOE activities at the site currently include research, environmental restoration, and waste management. Additional historical information regarding the Hanford Site is available on the Internet at http://www.hanford.gov.

In addition to the DOE activities at Hanford, there are several facilities operated by other agencies at the site. The Laser Interferometer Gravitational Wave Observatory (LIGO) is an advanced scientific observatory for measuring gravity waves at extremely low levels. The project involves the California Institute of Technology, the Massachusetts Institute of Technology, and the National Science Foundation. The Hanford Site was selected for the LIGO because of its available space and seismic stability. A

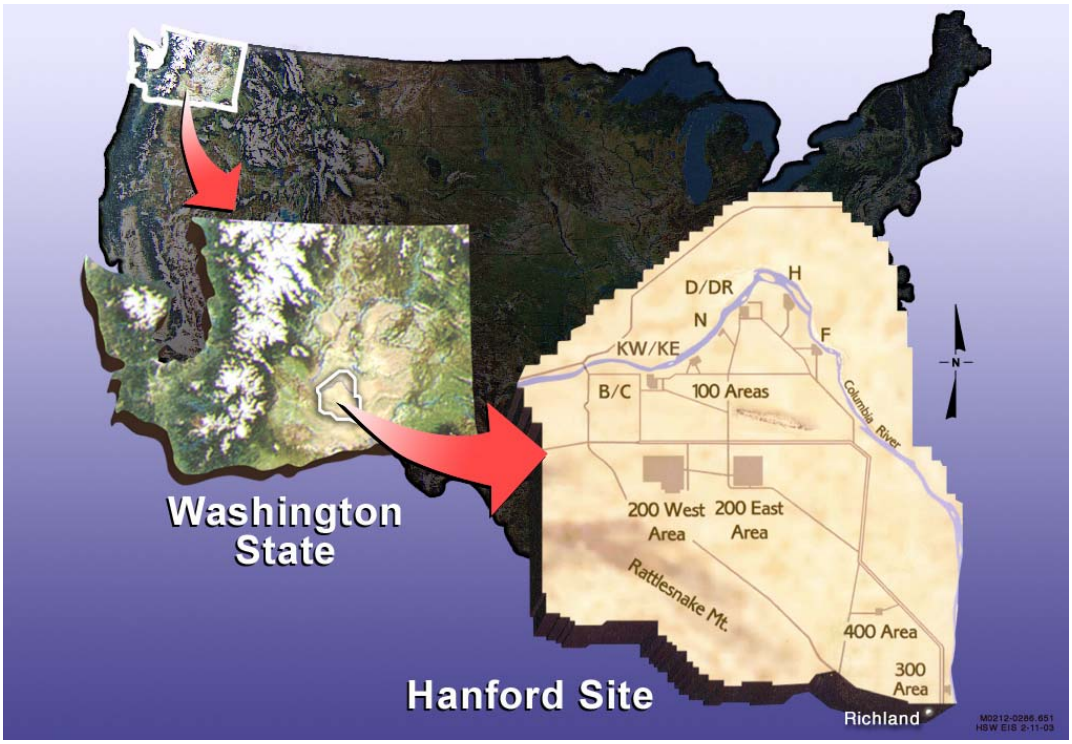

Figure 1.1. Hanford Site Location Map

commercial nuclear power plant, the Columbia Generating Station, also operates within the Hanford Site. That facility is located on property leased to Energy Northwest, a consortium of regional public utilities.

The largest non-DOE federal agency at Hanford is the U.S. Fish and Wildlife Service, which co-manages with DOE the 195,000-acre Hanford Reach National Monument, which was established by presidential proclamation on June 9, 2000. The monument includes the Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE), Saddle Mountain Wildlife Refuge, Wahluke Slope, White Bluffs, the sand dune area northwest of the Energy Northwest Site, historic structures (including homesteads from small towns established along the riverbanks in the early 20th century), and land 0.4 km (¼ mi) inland on the south and west shores of the 82-km (51-mi) long Hanford Reach, the last free-flowing, non-tidal stretch of the Columbia River. Also included were the McGee Ranch and Riverlands area and the federally owned islands within that portion of the Columbia River.

US Ecology, Inc. operates a commercial low-level radioactive waste disposal facility on 40.5 hectares (100 acres) of the Hanford Site near the 200 East Area leased by Washington State from DOE. The facility is licensed by the U.S. Nuclear Regulatory Commission (NRC) and the State of Washington, not DOE. The US Ecology facility is one of three commercial LLW disposal facilities in the United States. It currently accepts waste from two state compacts established to manage radioactive waste from nuclear power plants and other commercial facilities: the Northwest Compact (Washington, Idaho, Oregon, Montana, Wyoming, Utah, Alaska, and Hawaii) and the Rocky Mountain Compact (Colorado, Nevada, and New Mexico). Waste is received from hospitals, universities, research facilities, commercial nuclear

power operations, and other industries within the compact states. The reactor vessel from the Trojan plant, a commercial nuclear power reactor in Oregon, was buried at the site during 2000. Of the total waste receipts at the facility between 1996 and 2001, the state of Oregon accounted for the largest share by volume (65%) and by radioactivity (95%).

1.3.1 DOE National Waste Management

When DOE established the Office of Environmental Management (EM) in 1989, it defined cleanup of DOE sites as a top priority and committed itself to addressing the challenges of waste management. EM is responsible for waste management activities at all DOE sites, including Hanford, and needs to address them on a nationwide basis. This section provides an overview of DOE nationwide plans for management of radioactive and hazardous waste, including waste from the Hanford Site. The nationwide distribution of sites that dispose of one or more types of DOE radioactive waste are shown in Figure 1.2. The DOE nationwide strategy for managing radioactive, hazardous, and mixed waste is provided by the WM PEIS (DOE 1997c) and associated Records of Decision (RODs) (63 FR 3629, 63 FR 41810, 64 FR 46661, 65 FR 10061, 65 FR 82985, 66 FR 38646, 67 FR 56989). Other NEPA documents related to those activities are discussed in Section 1.5.

1.3.1.1 Spent Nuclear Fuel and High-Level Waste

DOE is required by *The Nuclear Waste Policy Act of 1982*, as amended (42 USC 10101) to provide disposal capacity for spent nuclear fuel (SNF) generated by commercial nuclear power plants and DOE, as well as high-level waste (HLW) generated by atomic energy defense activities. Spent nuclear fuel is fuel that has been irradiated in a reactor but has not been processed to separate potentially useful materials. High-level waste consists of certain process residues (liquids, solids, or sludges) that result from processing irradiated reactor fuel to recover plutonium and uranium. DOE sites that currently manage HLW and spent nuclear fuel are in the process of stabilizing and storing those materials until a permanent disposal facility is available. DOE is planning to develop a geologic repository at Yucca Mountain in Nevada for disposal of DOE and commercial spent nuclear fuel and HLW from processing of defense materials production reactor fuel (DOE 2002d). The repository is scheduled to open around 2010.

Spent Nuclear Fuel (SNF)
Fuel that has been irradiated in a nuclear power plant or other reactor. Spent fuel is generally thermally hot and highly radioactive.

High-Level Waste (HLW)
High-level waste is the highly radioactive waste material that results from processing of spent nuclear fuel, including liquid waste produced directly in processing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that is determined, consistent with existing law, to require isolation.

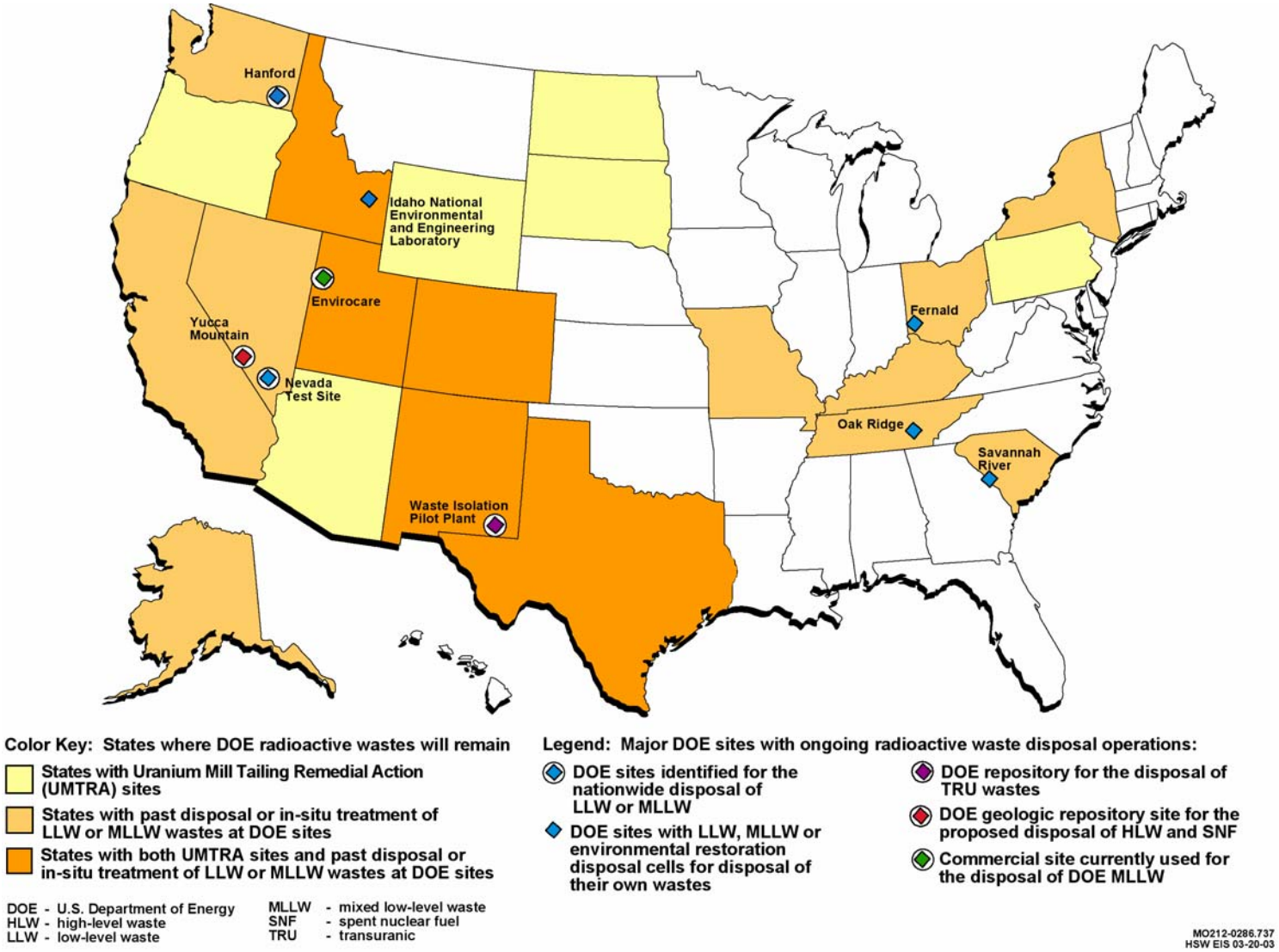

Figure 1.2. States with Radioactive Waste Disposal Activities

1.3.1.2 Transuranic Waste

DOE has a repository for disposal of TRU waste in New Mexico at WIPP. WIPP opened in 1999 and received the first shipments of TRU waste from Hanford in 2000. To date, about 80 m^3 (2800 ft^3) of TRU waste from Hanford have been sent to WIPP. Some TRU waste will also be sent to Hanford for temporary storage from other DOE sites to take advantage of existing and planned capabilities to process and certify TRU waste for disposal at WIPP. All TRU waste sent to Hanford will be shipped to WIPP.

Transuranic (TRU) Waste

Transuranic waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for the following:

- high-level radioactive waste
- waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations
- waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR 61 (DOE 2001g).

Some TRU waste may also contain hazardous components (mixed TRU waste) and would be managed under applicable state and federal hazardous waste regulations. For purposes of evaluation in the HSW EIS, mixed TRU waste has not been identified as a separate waste type from other TRU waste. DOE's hazardous waste permit for WIPP, issued by the State of New Mexico Environment Department, authorizes disposal of some types of mixed TRU waste.

1.3.1.3 Low-Level Waste and Mixed Low-Level Waste`

DOE plans to continue treating and disposing of LLW and MLLW at facilities that currently have capabilities to manage those wastes (DOE 1997c; 65 FR 10061). Under that ROD, Hanford and the Nevada Test Site (NTS) will continue to receive LLW from other facilities that do not have the capacity to treat or dispose of it. Hanford and NTS were also identified as sites that would treat and dispose of MLLW from other sites. DOE sites also have the option to send waste to commercial disposal facilities, such as Envirocare in Utah. Envirocare received over 56,000 m^3 (2,000,000) of DOE LLW and MLLW between 1993 and 2000 (Envirocare 2000a, b, c). DOE plans to continue shipping some LLW and MLLW to Envirocare. NTS received about 65,000 m^3 (2,300,000 ft^3) of LLW during 2002 and expects to receive an additional 360,000 m^3 (13,000,000 ft^3) through 2006. By comparison, existing forecasts through 2046 indicate that DOE's

Low-Level Waste (LLW)

Low-level radioactive waste is radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in Section 11e.(2) of the Atomic Energy Act of 1954, as amended), or naturally occurring radioactive material.

Mixed Low-Level Waste (MLLW)

Mixed low-level waste is LLW that contains both radionuclides subject to the Atomic Energy Act of 1954, as amended (42 USC 2011), and a hazardous component subject to the Resource Conservation and Recovery Act or Washington State Dangerous Waste Regulations.

Hanford Solid Waste Program could receive up to 220,000 m^3 (7,800,000 ft^3) of LLW and up to 140,000 m^3 (4,900,000 ft^3) of MLLW from offsite DOE generators. Total LLW and MLLW annual volumes from offsite generators are not expected to exceed 45,000 m^3 (1,600,000 ft^3).

The Tank Waste Remediation System (TWRS) EIS summarized formal discussions between DOE and NRC on tank waste classification and how the low-activity portion of the waste might be regulated (DOE and Ecology 1996). Although those consultations were carried out in the context of low-activity waste (LAW) disposal in a grout matrix (Kincaid et al. 1995), the logic was applied to vitrified LAW as well. Based on an NRC published opinion (Bernero 1993; 58 FR 12342), the TWRS EIS analysis concluded that the LAW stream could be classified as incidental waste and subjected to disposal requirements for LLW. A second NRC review subsequent to the TWRS EIS indicated that the vitrified waste form selected in the ROD (62 FR 8693) also would provisionally meet criteria for classification as LAW, based on available information provided at that time (NRC 1997).

Low-Activity Waste (LAW)
Low-activity waste is the waste that remains after separating from high-level waste as much of the radioactivity as practicable, and that when solidified may be disposed of as low-activity waste in a near-surface facility in accordance with DOE requirements (DOE 2001g).

Immobilized Low-Activity Waste (ILAW)
Immobilized low-activity waste is the solidified low-activity waste from the treatment and immobilization of Hanford tank waste. The ILAW would be disposed of on the Hanford Site or at a qualified offsite facility.

1.3.2 DOE Waste Management Activities at Hanford

Waste generated by past Hanford Site activities contains a variety of radionuclides and non-radioactive hazardous constituents. Those materials range from highly radioactive wastes that must be managed in specialized facilities to less radioactive waste that can be managed by more conventional means, such as shallow land disposal. EM activities at the Hanford Site involve radioactive waste and other radioactive materials. These wastes and materials require different management approaches depending on their specific characteristics, location, and legal and regulatory requirements.

DOE's waste management policy includes reducing the hazards of waste to people and the environment by minimizing generation of new waste, by treating waste, by placing waste in safer configurations, and by removing waste from environmentally sensitive areas, such as along the Columbia River.

The Hanford programs for spent nuclear fuel, HLW, environmental restoration, liquid waste and groundwater protection are covered under other NEPA and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 USC 9601) reviews. However, they influence the scope of this HSW EIS as generators of waste that would ultimately be managed under the resulting decisions. The relationship of the HSW EIS to the major EM activities at the Hanford Site is outlined here (see Appendix N for additional information):

- Spent nuclear fuel: Sludge generated during removal of spent fuel and cleanout of the K Basins would be stored at T Plant until a facility is available to process and certify it for shipment to WIPP. In addition, LLW, MLLW, and TRU waste may be generated during activities at the K Basins.

- High-level waste treatment: ILAW and melters from the WTP would be disposed of in near-surface facilities at Hanford. Waste from WTP operations would also require disposal, including equipment removed from HLW tanks during retrieval of HLW and waste generated during operation of the WTP.

- Environmental restoration activities: TRU waste retrieved during CERCLA cleanup of the 618-10 and 618-11 burial grounds would be processed and certified for shipment to WIPP, and other operational waste from cleanup activities may require treatment and disposal. The Environmental Restoration and Disposal Facility (ERDF) may also be selected as a potential disposal site for LLW, MLLW, melters, and ILAW. Under DOE policy, NEPA values are integrated into the CERCLA process prior to making remediation decisions (DOE 1994).

- Liquid waste: Leachate from lined disposal trenches would be treated at the Effluent Treatment Facility (ETF), and some solids from ETF would be returned to the Low Level Burial Grounds (LLBGs) for disposal. Other operational waste generated during liquid waste treatment may also be disposed of at Hanford.

1.3.2.1 Groundwater Protection

Groundwater in the unconfined aquifer beneath the Hanford Site ultimately surfaces at springs near or in the Columbia River, which traverses the northern and eastern parts of the site. Some of the groundwater is contaminated by radionuclides and hazardous chemicals as a result of past liquid disposal practices, leaks, and spills. Past practices that contributed to groundwater contamination have been discontinued, including disposal of untreated liquids to the ground. Programs are underway to stabilize and clean up remaining materials, soil, and groundwater plumes that could present a threat to human health and the environment in the future. Ongoing radioactive and hazardous waste management practices comply with applicable standards, and they are evaluated on a continuing basis to minimize environmental degradation.

Groundwater monitoring at Hanford is being addressed under milestones established by the TPA independently of this HSW EIS. Groundwater monitoring requirements would apply to whatever actions DOE decides to implement as a result of the analyses conducted under this HSW EIS.

DOE and a team of contractors have developed, and are implementing, a sitewide program that integrates all assessment and remediation activities that address key groundwater, vadose zone, and related Columbia River issues. This effort is coordinated by the Groundwater Protection Program to support cleanup and closure decisions for the Hanford Site and protection of the Columbia River. Information developed under that program was used to evaluate long-term impacts of LLW and MLLW disposal in this revised draft HSW EIS. Additional information can be found in Appendix N and at http://www.bhi-erc.com/projects/vadose/.

1.3.2.2 The Tri-Party Agreement

Beginning in 1986, DOE, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) began to examine how best to bring the Hanford Site into compliance with RCRA, CERCLA, and applicable State hazardous waste regulations. The regulatory agencies and DOE agreed to develop one compliance agreement establishing milestones for conducting Hanford Site cleanup activities under CERCLA and for bringing operating facilities into compliance with RCRA. Negotiations concluded in late 1988, and the TPA was signed by the three participating agencies on January 15, 1989 (Ecology et al. 1989). The TPA includes a process for revising milestones by mutual agreement of the agencies. Milestones established under the TPA influence some activities proposed in this revised draft HSW EIS. The TPA is discussed further in Section 6.2.

1.3.2.3 DOE Decisions Related to Waste Management at Hanford

Several decisions have already been made that affect the management of various wastes and other nuclear materials at Hanford. Some of the decisions described in this section are being implemented, and other actions are scheduled to begin at a future time. The relationship between those activities and the alternatives for waste treatment, storage, and disposal as discussed in this HSW EIS is depicted in Figure 1.3. The NEPA and CERCLA reviews that resulted in the decisions illustrated in the figure are also listed. The relationship of the HSW EIS to other documents is further discussed in Section 1.5.

- HLW in Hanford storage tanks will be retrieved and vitrified at an onsite facility. DOE plans to dispose of HLW in a geologic repository at Yucca Mountain in Nevada (DOE 2002d). The TWRS EIS ROD (62 FR 8693) calls for ILAW to be placed in concrete vaults on the Hanford Site.

- Spent nuclear fuel stored in the Hanford K Basins near the Columbia River will continue to be dried and moved to the 200 East Area until it can be sent to the Yucca Mountain repository. A small quantity of other reactor fuel currently stored at Hanford will also be stored in the 200 East Area until it can be disposed of at Yucca Mountain.

- The Hanford Site will manage TRU waste from onsite operations, such as stabilization of plutonium materials at former processing facilities, and from some other DOE sites that do not have capabilities to manage TRU waste. In addition, TRU waste will be retrieved from the 618-10 and 618-11 Burial Grounds near the 400 Area, and retrievably stored TRU waste will be retrieved from the 200 Area LLBGs. TRU waste will be treated as necessary and certified for disposal at WIPP near Carlsbad, New Mexico.

- LLW and MLLW from Hanford and other DOE sites will continue to be stored, treated, and/or disposed of at Hanford.

- Reactor compartments from decommissioned naval vessels will continue to be disposed of in a dedicated facility at Hanford.

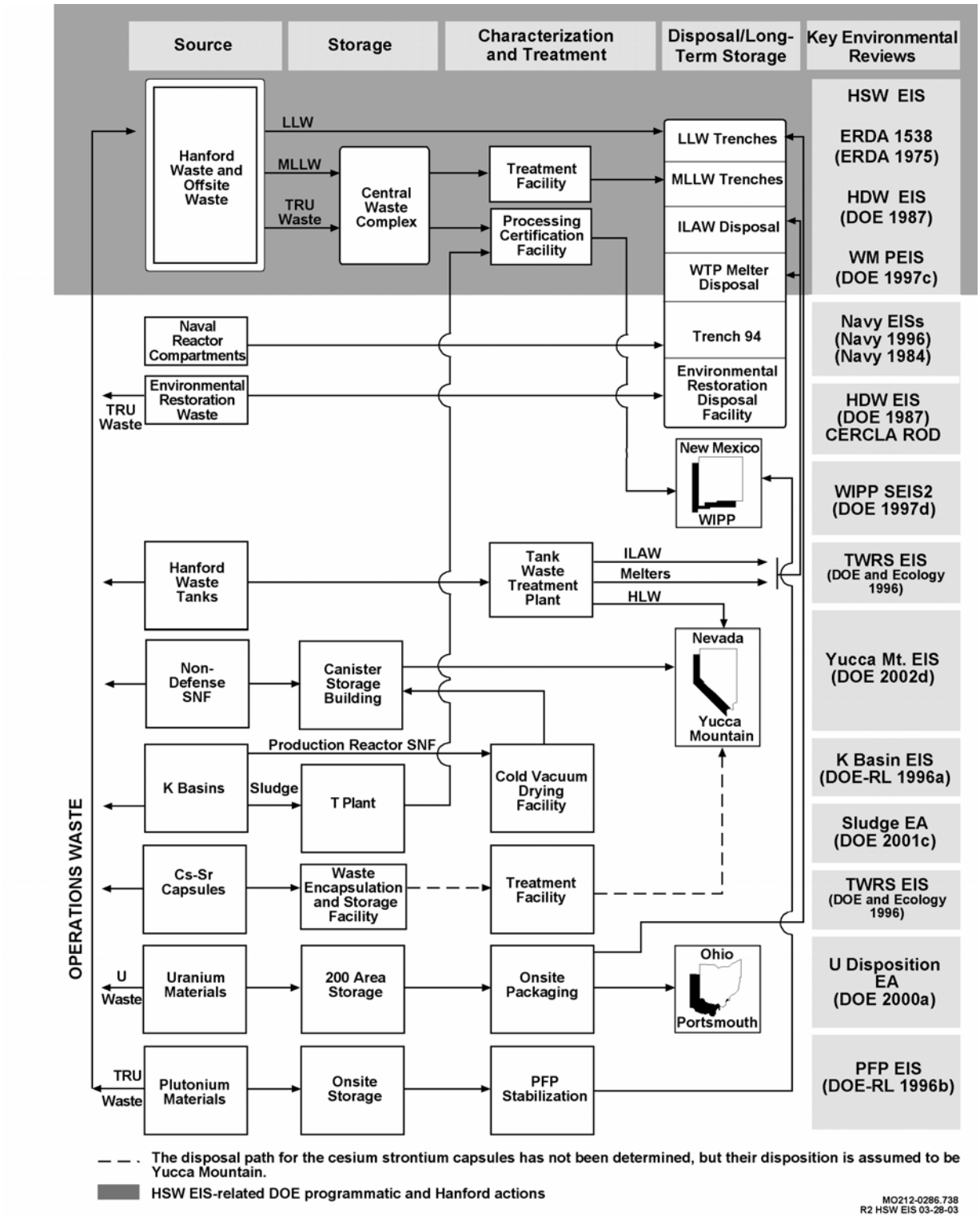

Figure 1.3. Relationship of the HSW EIS to Other Hanford Cleanup Operations, Material Management Activities, and Key Environmental Reviews

- Contaminated areas along the Columbia River will continue to be cleaned up, especially sites near closed reactors in the 100 Areas and near fuel fabrication facilities in the 300 Area. Closed reactors will be placed into interim safe storage (a process referred to as "cocooning") to protect people and the environment from the reactor cores until they can be safely removed. Most LLW and MLLW generated during Hanford environmental restoration projects will be sent to a dedicated onsite disposal facility, the Environmental Restoration Disposal Facility (ERDF).

The activities described in this section will result in most of the radioactive materials at Hanford being relocated to offsite facilities for disposal or other disposition. Figure 1.4 shows DOE's radioactive material disposition plans at Hanford based on their radioactive material content.

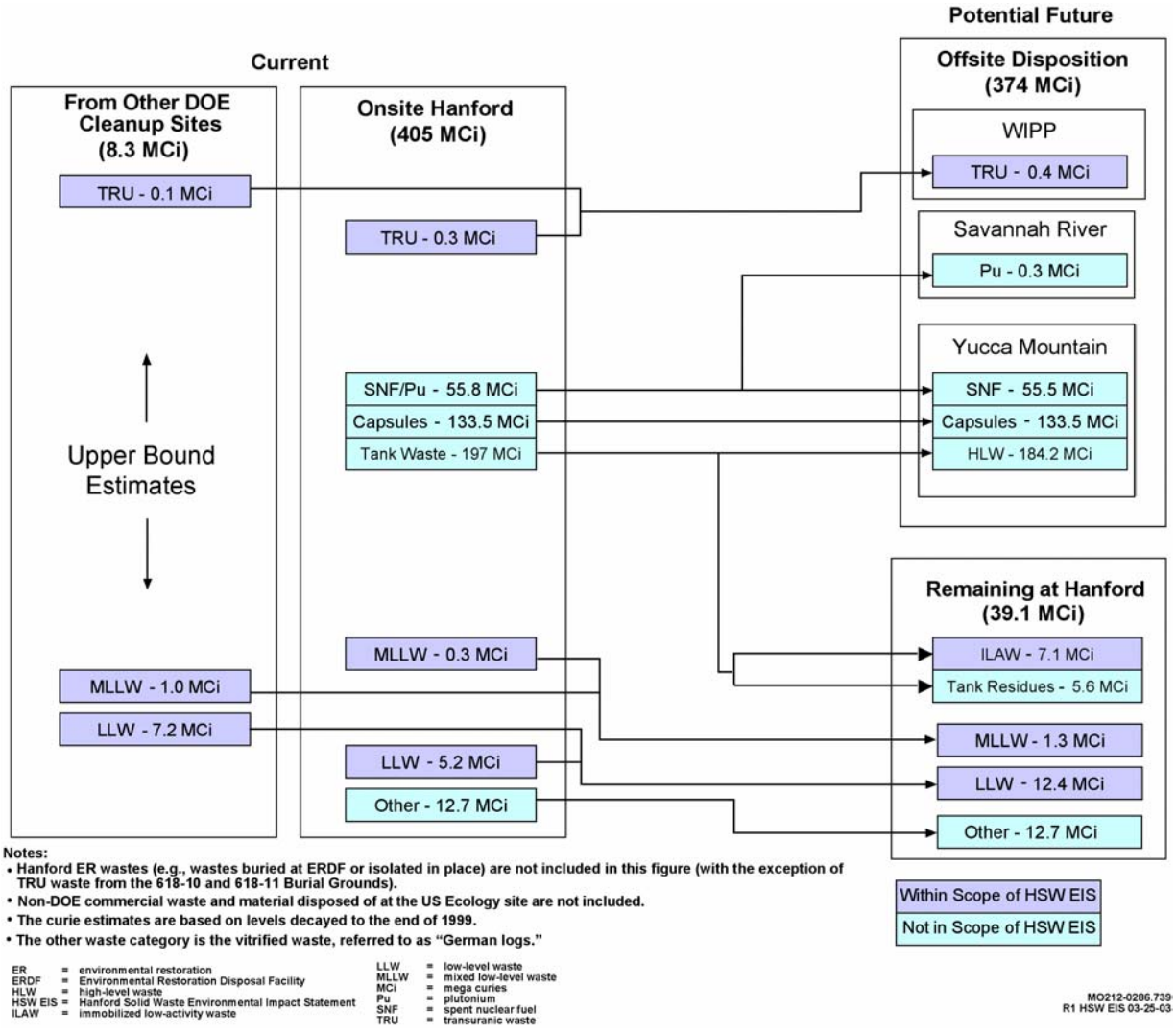

Figure 1.4. Radioactive Material Disposition at Hanford in Terms of Waste Activity (MCi)