2.4.3 DEEP BOREHOLE CATEGORY

Under this category of alternatives, surplus weapons-usable Pu would be emplaced into one or more deep boreholes drilled below the water table into ancient, geologically stable rock formations. The Pu disposal form is emplaced and sealed in the emplacement zone, typically 2-km (1.25-mi) long. The isolation zone, also typically about 2-km (1.25-mi) long extends from the top of the emplacement zone to the ground surface, and would be filled and sealed with appropriate materials. At emplacement depths, which would be several kilometers greater than those of mined geologic repositories, the groundwater is expected to be stagnant. Because the barrier to transport posed by the isolation zone and the siting of the facility at a carefully selected stable location with stagnant groundwater at depth, the Pu is expected to remain, for all practical purposes, permanently isolated from the biosphere.

This PEIS analyzes two alternatives for emplacing Pu into a deep borehole: direct disposition and immobilized disposition. These are discussed in Sections 2.4.3.1 and 2.4.3.2, respectively. Under both alternatives, emplacement in a deep borehole would provide a geologic barrier to proliferation that would be difficult, costly, and time-consuming to overcome for recovering the material. According to the NAS, Pu in deep boreholes would be inaccessible to potential proliferators, but would be accessible to the state in control of the deep borehole site. Since the deep borehole is accessible to the nation in control of the deep borehole site, redrilling the hole could technically be accomplished within a few months. However, such activity would be detected well before the Pu was retrieved. As a result, it is doubtful that potential proliferators could recover the Pu or the host nation could recover the Pu without being detected. Therefore, under both alternatives, the Pu would not need to be mixed with HLW or other highly radioactive material to increase proliferation resistance. Under the first alternative, surplus Pu would be encapsulated directly in suitable canisters and emplaced into the deep borehole. Under the second alternative, surplus Pu would be converted into a ceramic pellet immobilized form. The ceramic pellets would then be mixed with grout and an equal volume of Pu-free ceramic pellets and emplaced into the deep borehole without canisters. Under either alternative, the deep borehole would be sealed after completion of the emplacement.

The environmental impacts of emplacement in a deep borehole are evaluated at a generic site that would be characteristic of a deep borehole complex. The identification of a suitable location for a deep borehole requires detailed site-specific studies and is beyond the programmatic scope of the Storage and Disposition PEIS. [Text deleted.] In addition, the regulatory requirements that the deep borehole must satisfy for site characterization and licensing for long-term disposal would have to be developed by the appropriate regulatory bodies.

2.4.3.1 Direct Disposition Alternative

Under this alternative, surplus Pu would be removed from storage, processed as necessary through the pit disassembly/conversion facility and/or the Pu conversion facility, packaged, and placed into a deep borehole. The deep borehole would be sealed to isolate the Pu from the accessible environment. The Direct Disposition Alternative does not require direct handling of dispersable Pu at the deep borehole site. Long-term performance of the deep borehole would depend on the stability of the geologic system to ensure isolation of Pu until rendered stable. No specific deep borehole locations have been identified but a generic assessment of site availability has been performed and site selection criteria have been developed (LANL 1996m:7-8, 27-38). This study has shown that suitable sites can be found in many regions of the continental United States. All requirements shown in this section are in addition to those previously stated for the pit disassembly/conversion and Pu conversion facilities.

Facility Description. Under the Direct Disposition Alternative, a deep borehole complex would be sited and constructed to dispose of surplus Pu material (Pu in various forms). Pu from the pit disassembly/conversion and Pu conversion facilities would be packaged to preclude criticality as determined by deep borehole disposal requirements. Two 2.25-kg (5-lb) product cans, a total of 4.5 kg (10 lb) of Pu, could be appropriately spaced inside each PCV. The PCV would be placed inside a shipping container (like a 6M) and shipped by SST to the deep borehole complex. The sealed PCVs would be removed from the shipping containers at the deep borehole complex and placed directly into metal emplacement canisters and sealed with kaolinite sealant, without any handling of dispersable Pu material. Emplacement canisters would be 0.4-m (16 in) in diameter, 6.1-m (20-ft) long, and contain 9 PCVs, which collectively contain 40.5 kg (89 lb) of Pu. Twenty-five emplacement canisters would be connected end-to-end in an emplacement string approximately 150-m (500-ft) long to facilitate faster canister insertion. A material flow diagram can be found in Figure 2.4.3.1–1.

The deep borehole subsurface facilities analyzed in this PEIS would consist of an array of four separate deep boreholes, with each deep borehole separated approximately 500 m (1,640 ft) from the nearest hole. Each deep borehole could be up to 4 km (2.5 mi) in depth. Figure 2.4.3.1–2 shows a typical deep borehole in which the upper 2 km (1.25 mi) or more of depth (the isolation zone) would pass completely through the water table and sedimentary and/or fractured crystalline rocks. The isolation portion of each borehole would be cased with steel pipe and filled and sealed with appropriate sealing materials to prevent influx and contamination of near surface waters. The lower 2 km (1.25 mi) would be drilled into crystalline basement rock that is isolated from the accessible environment. The emplacement zone of each borehole would contain 12 individual 150-m (500-ft) emplacement canister strings that would be grouted or cemented into place. Undercut seals would be installed between the canister strings in the emplacement zone for additional protection.

The deep borehole complex would occupy a land area of approximately 2,041 ha (5,043 acres), of which 57 ha (141 acres) would be occupied by the main facility and the assumed four-hole borehole array, with the remaining approximately 2,000 ha (4,940 acres) being buffer zone. Operations involving the Pu disposal form in the Surface Processing Facility are performed in an MAA that is hardened for security purposes. However, no direct contact with Pu is required. The MAA and facilities supporting MAA operations are located in a PA. The emplacement and borehole sealing facility to which the emplacement canisters are brought is also within a PA. Each PA is a secure, fenced area. The PA and operations involving any classified materials are contained within the LA. The PPA surrounds the LA and includes the buffer zone around the facility. The passenger vehicle parking and personnel services facilities are located outside the LA but within the PPA. A deep borehole facility site layout perspective is shown in Figure 2.4.3.1–3, and a list of deep borehole site buildings can be found in Appendix B.

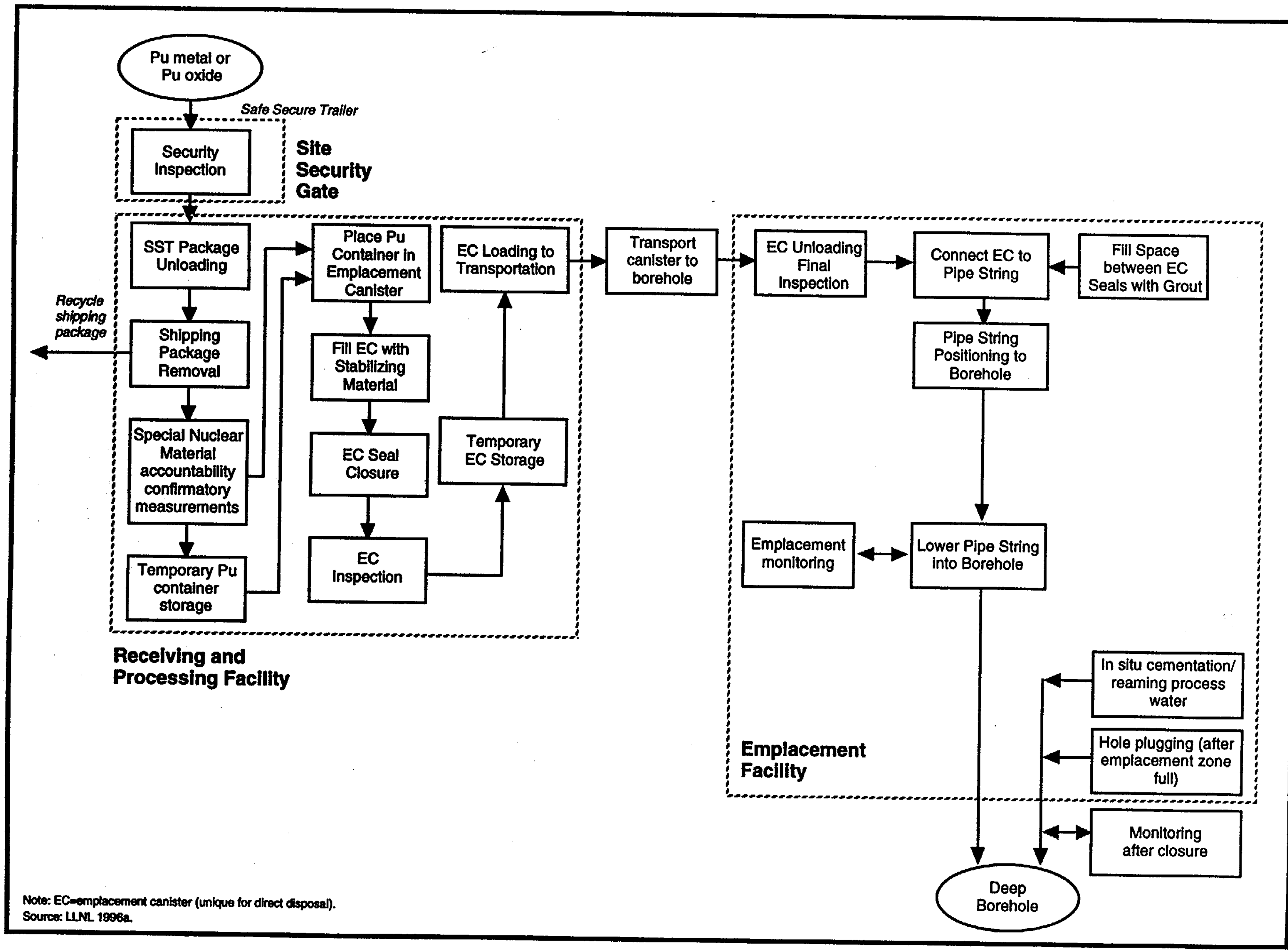
The deep borehole complex would be designed to ensure that surface facilities could withstand earthquakes, high winds, or floods. The fire protection systems of the facility would be in accordance with DOE Orders and National Fire Protection Association Codes and Standards. The physical security, MC&A, IAEA safeguards, and physical security system facilities would be consistent with protecting Pu materials in the deep borehole complex surface facilities. In addition, the material would be emplaced to ensure post-emplacement downhole nuclear criticality safety.

The deep borehole complex would be a stand-alone site containing five types of facilities grouped by function. These five are described in the following:

Surface Processing Facilities. Surface processing facilities would receive the Pu metal and oxide disposal forms, provide lag storage of the received Pu materials, load emplacement canisters with the Pu metal and oxide disposal forms, and seal the canisters.

Drilling Facilities. Drilling rigs (either portable or constructed in place) would drill boreholes, seal natural and drilling-induced hydraulically conductive pathways in the host rock, install the casing in the isolation zone, and cement behind the casing to ensure a good hydraulic seal. Drilling facilities would mix various additives into the drilling mud and bring up brine from the bottom of the borehole as it is drilled. For this reason, each drilling facility would be provided with a wastewater treatment subsystem.

Emplacing-Borehole Sealing Facilities. One or more emplacing-borehole sealing facilities would emplace the Pu-bearing canisters, seal around the canister, and plug the upper 2-km (1.25-mi) isolation zone of the deep



Note: EC=emplacement canister (unique for direct disposal).
Source: LLNL 1996a.

Figure 2.4.3.1–1. Deep Borehole Facility Material Flow Diagram —Emplaced Canisters—Direct Disposition Alternative.

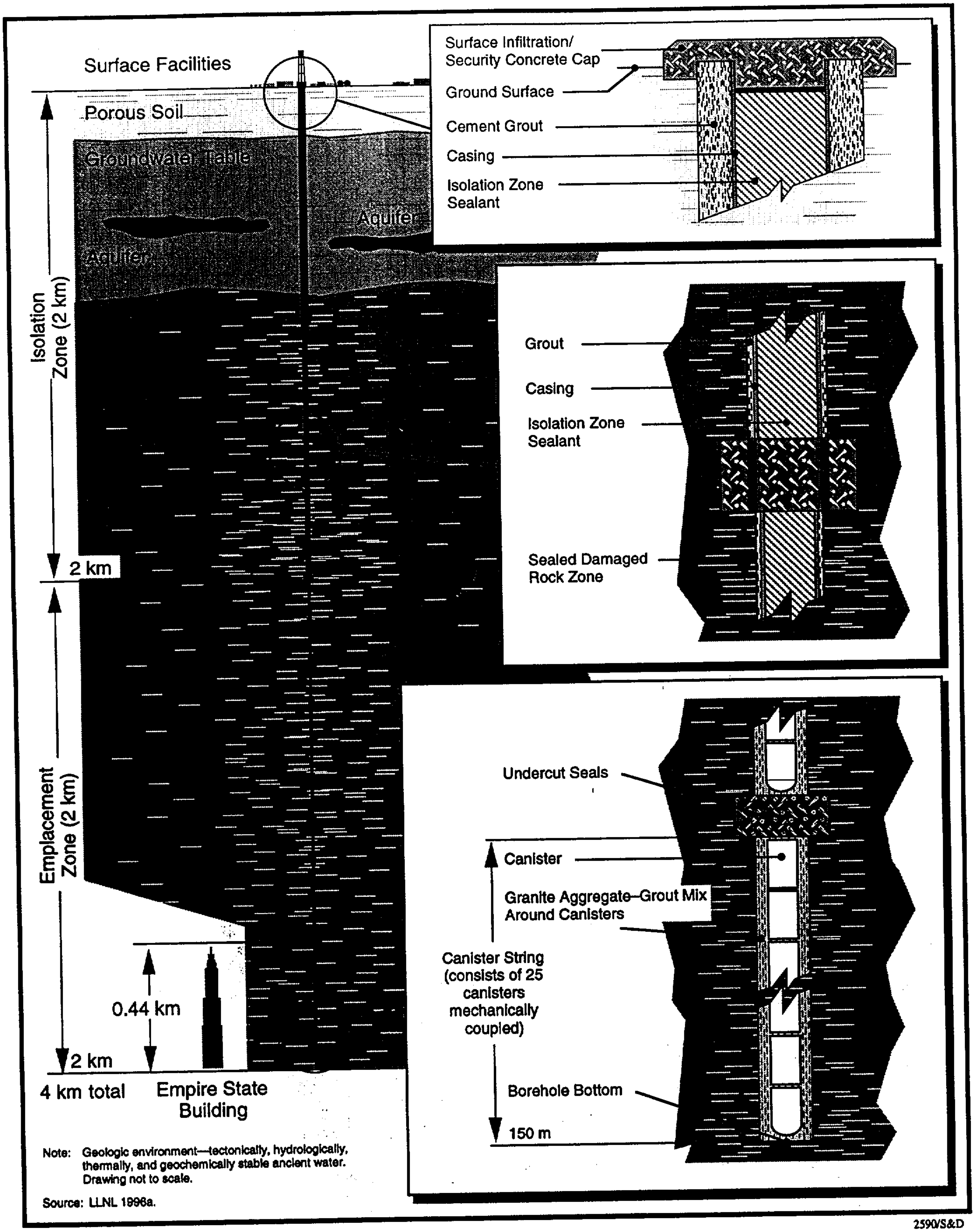


Figure 2.4.3.1–2. Cross-Section—Deep Borehole Typical Arrangement With Emplaced Canisters—Direct Disposition Alternative.

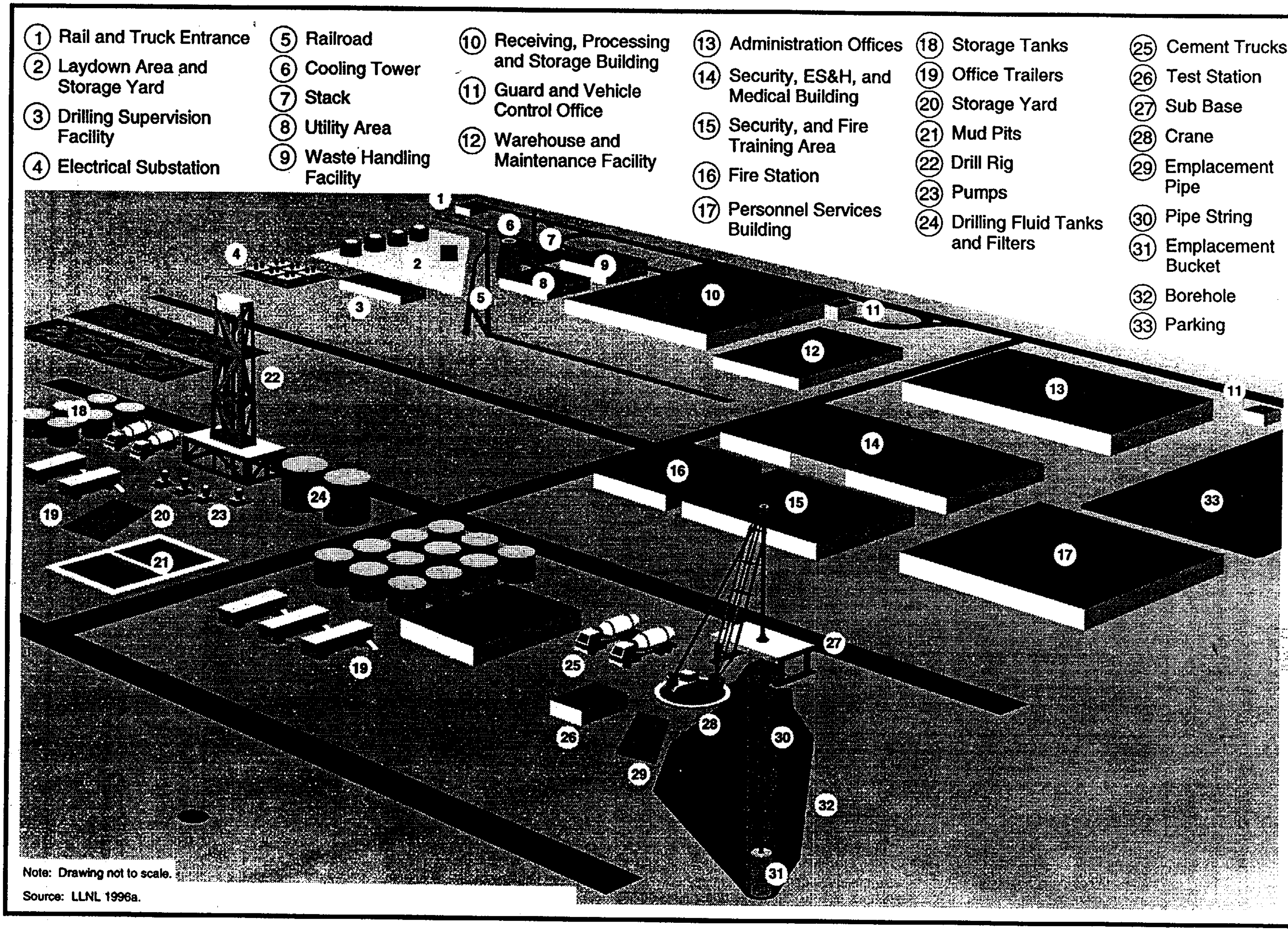


Figure 2.4.3.1–3. Conceptual Deep Borehole Facility Site Layout—Direct Disposition Alternative (Perspective).

borehole. Workers would assemble canister modules into canister strings for emplacement at this subfacility. Under normal conditions, the water pumped from the borehole during emplacement operations would not be contaminated with radioactivity, and the wastewater would be treated as in any drilling operation. However, the water must continually be tested for radioactive contamination, and if contaminated, the water would be redirected to the main facility process wastewater treatment system. A containment structure covers the borehole entrance and emplacing equipment to contain any Pu that could be released in the event of an accident or canister breakage during emplacement.

Waste Management Facility. A waste management facility would treat the process wastes, process wastewater, utility wastewater, and sanitary wastewater generated by borehole disposal operations.

Support and Balance-of-Plant Facilities. A support facility would consist of administration, plant operations, and BOP. The BOP facilities would include security, plant alarm, safety and decontamination systems, shipping and receiving, central warehouse, maintenance, and utilities to provide general operational support.

Facility Operations. The borehole facility could process and dispose of 5 t (5.5 tons) of Pu, in all forms, each year. Operations would be based on continuous operations 7 days a week, 24 hours a day, in two 12-hour shifts with three drilling crews. A surge capacity of 10 t/year (yr) (11 tons/yr) could be achieved by introducing a second 8-hr shift in the surface processing and emplacing-borehole sealing facilities and by adding a second drilling rig and extra crews, as needed, in the drilling facility. Utility consumptions, chemicals consumed, and the number of personnel required during operations are listed in Appendix C.

The raw water requirement for the deep borehole disposal facility would be approximately 166 million liters (l) yr (44 million gallons [gal]/yr), of which 91 million l/yr (24 million gal/yr) would be consumed by the main facility area and the remainder consumed by the drilling and emplacing-borehole sealing facilities in the borehole array area. A raw water subsystem could be provided from production wells, supply pumps, and transfer piping to the facility water subsystem. The annual water balance for the borehole facility is shown in Appendix D.

Construction. Additional land area requirements during construction would be approximately 6 ha (15 acres) for construction laydown, warehousing, and temporary parking. The construction of the borehole complex would require 3 years and have a peak annual employment of 870 construction workers. Materials and resources consumed and employment needs during construction are listed in Appendix C.

Construction of the deep borehole array requires drilling several boreholes up to 4-km (2.5-mi) deep into geologically stable rock formations. This would be accomplished using drilling techniques based on technology developed for and used extensively in the petroleum, mining, and scientific drilling industries, and for deep boreholes drilled in crystalline rocks for disposal of HLW. The drill system would include a derrick to lower and raise the drillstring and bit and to route the slurry and cuttings. A slurry of water, compressed air, and bentonite additives would be pumped into the borehole to bring up cuttings. The used slurry then would be sent to a holding area to allow cutting solids to settle. The slurry would be filtered to remove coarser particles before it is recycled. When drilling holes down, two pipes, one inside the other, would be used. The fresh mud slurry would flow in the area between pipes (the annulus), and the cuttings would flow to the surface through the center pipe.

Boreholes would be drilled with their diameter decreasing with depth in a stepwise fashion, as dictated by site drilling conditions. A metal casing, smaller in outside diameter than the hole, would be inserted, and a cement slurry would be pumped at high pressure into the annulus between the casing and rock or soil in the isolation zone. Casing is not used in the emplacement zone. At specific locations in the borehole, the hole would be widened (undercut) to a larger diameter to provide a seat for seals and plugs. These seals and plugs, required to prevent vertical migration of fluids, would be installed during canister emplacement to achieve borehole closure.

A 3-year construction schedule is assumed for the deep borehole facility. The estimated total quantity of generated solid and liquid wastes associated with construction of the deep borehole disposal facility is shown in Appendix E. The waste generation data are based on factors from historic data on construction area size and construction labor force. Solid wastes would be hauled offsite for disposal during the construction period.

Waste Management. Waste management for the deep borehole complex would handle the treatment of criteria air pollutants, toxic and hazardous air emissions, and other gases emitted during operation and construction. Facility waste management would also include handling and treatment operations for processing TRU, low-level, and mixed waste, as well as industrial waste in aqueous, organic liquid, or solid forms generated from the onsite deep borehole disposition operations or from other site activities. Waste management would be in accordance with DOE Order 5820.2A and RCRA. TRU waste generated from deep borehole operations would be treated and packaged for disposal to WIPP (should DOE decide to operate WIPP for TRU disposal) in accordance with WIPP WAC (WIPP-DOE-069) and in accordance with decisions to be made as a result of the *Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement.* A waste management process flow diagram is shown in Appendix E.

Estimated annual quantities of air pollutant emissions due to operation of the deep borehole disposal facility are shown in Appendix F. These emissions would result from minor borehole gases and fuel and gas consumption necessary to drill and, later, close the deep boreholes. Chemical processes that may lead to the release of contamination over time are unlikely in the abbreviated times associated with the canister emplacement, backfill, and closing processes. More likely are releases resulting from mechanical accidents where the containment canisters are breached.

Transportation. Intrasite transport of radiological materials will be limited to Pu metal and oxide container transport. There is no handling or processing of Pu on the site under normal operations. Intersite transportation of Pu material coming into the deep borehole facility from offsite would be in SSTs.

2.4.3.2 Immobilized Disposition Alternative

The second disposition alternative based on the deep borehole concept would immobilize surplus Pu in a ceramic spherical pellet form. Under this alternative, the output material from the pit disassembly/conversion and Pu conversion facilities would be sent to a ceramic immobilization facility. The ceramic immobilization facility would receive Pu feed in both oxide and metal forms. The output from the ceramic immobilization facility would be 2.54-centimeter (cm) (1-inch [in]) diameter coated ceramic pellets containing 1 percent by weight Pu. The ceramic pellets of Pu would be shipped by SST to the deep borehole facility. At the deep borehole facility the Pu-loaded ceramic pellets would be mixed with an equal volume of Pu-free commercially produced ceramic pellets and kaolinite clay grout and the mix would be directly emplaced in the borehole without any canisters. The drilling operations at the borehole facility would be similar to those described in the previous section. The emplacement of ceramic pellet-grout mix would be done either by bucket delivery or by pneumatically pumping slugs of the ceramic pellet-grout mix down a drill pipe. The sealing of the boreholes to isolate the emplaced Pu from the accessible environment would be as described in the previous section. Although representative locations for the ceramic immobilization facility are analyzed, no specific deep borehole locations have been considered. All requirements shown in this section, both for the ceramic immobilization facility and the deep borehole, are additive and are in addition to those requirements previously described for the pit disassembly/conversion and the Pu conversion facilities.

Facility description and operations, construction, waste management, and transportation descriptions for the ceramic immobilization facility are in the next section. They are followed by facility description and operations, construction, waste management, and transportation descriptions for the deep borehole complex.

2.4.3.2.1 *Ceramic Immobilization Facility—Immobilized Disposition Alternative*

Facility Description. A ceramic immobilization facility site of 18 ha (45 acres) would be required. The ceramic immobilization facility site layout is shown in Figure 2.4.3.2.1–1. The facility would be centered around a Pu processing facility and would contain waste processing and support facilities. The list of facilities is found in Appendix B. Support processes required at the immobilization facility would include radioactive liquid waste treatment, process offgas treatment, and waste solidification. Scrap recovery and Pu recycle, MC&A, cold chemical storage and makeup, process gas supply, material handling, equipment decontamination, and maintenance systems would also be required.

The ceramic immobilization facility would be designed to ensure that surface facilities could withstand earthquakes, high winds, and floods. The fire protection systems of the plant would be in accordance with DOE orders and National Fire Protection Association Codes and Standards. The material would be handled to ensure criticality safety. The physical security, materials control and accountability, IAEA safeguards, and physical security system facilities would be consistent with protecting DOE-defined Category I and II type special nuclear materials.

Facility Operations. Operations at the ceramic immobilization facility would process both Pu metal and oxide. The Pu metal would be oxidized, added to the material received as Pu oxide, and the oxides dissolved in an electrochemical solution consisting of nitric acid and silver nitrates. Plutonyl nitrate solution formed from the dissolution process would be mixed with ceramic additives called precursors. After sampling and feed adjustment, the solution would be calcined in a rotary calciner and converted to oxide powder. The powder would be fed into an anvil powder compacting press, which would compact the oxide powder to form green ceramic pellets. The pellets would be sintered at 1,200 degrees Celsius (°C) (2,200 degrees Fahrenheit [°F]) for about 8 hours. The resultant pellets would be spheres, about 2.54 cm (1 in) in diameter, and would contain about 1 percent Pu by weight. The pellets would contain Pu dispersed throughout the sphere, with an exterior coating of durable non-Pu-bearing ceramic material, and would be shipped to the deep borehole site via SST. The material flow through the ceramic immobilization process is shown in Figure 2.4.3.2.1–2.

The ceramic immobilization facility could process Pu metal and PuO_2 feed in the amount of 25 kg/day (55 lb day). Operations would be based on 3 shifts per day, 7 days per week, 24 hours per day. Normal plant availability is considered to be 200 days per year. The oxide dissolution rate is about 1.1 kg/hour (h) (2.4 lb/h). About 126 l (33 gal) of 200 g Pu/l (1.6 lb/gal) plutonyl nitrate solution is produced each day. Annual utility consumptions for the ceramic immobilization facility are listed in Appendix C, along with the chemicals consumed during ceramic immobilization operations and the number of personnel required during ceramic immobilization operations.

The raw water requirement for the ceramic immobilization facility would be approximately 322 million l/yr (85 million gal/yr). The annual water balance diagram for the ceramic immobilization facility is shown in Appendix D.

Construction. Additional land area requirements during construction of the ceramic immobilization facility would be approximately 28 ha (70 acres) of land for construction activities, laydown, and temporary parking. The construction of the ceramic immobilization facility would require 5 years and have a peak annual employment of 1,000 construction workers. Materials and resources consumed and employment needs during facility construction are listed in Appendix C. The peak construction year is based on the construction schedule. Estimated total quantities of solid and liquid wastes generated from activities associated with construction of new facilities are shown in Appendix E. [Text deleted.] Solid wastes would be hauled offsite for disposal during the construction period.

Waste Management. The ceramic immobilization facility would have its own facilities to control emissions of criteria pollutants, toxic and hazardous air pollutants, and other gases emitted during operation and construction.

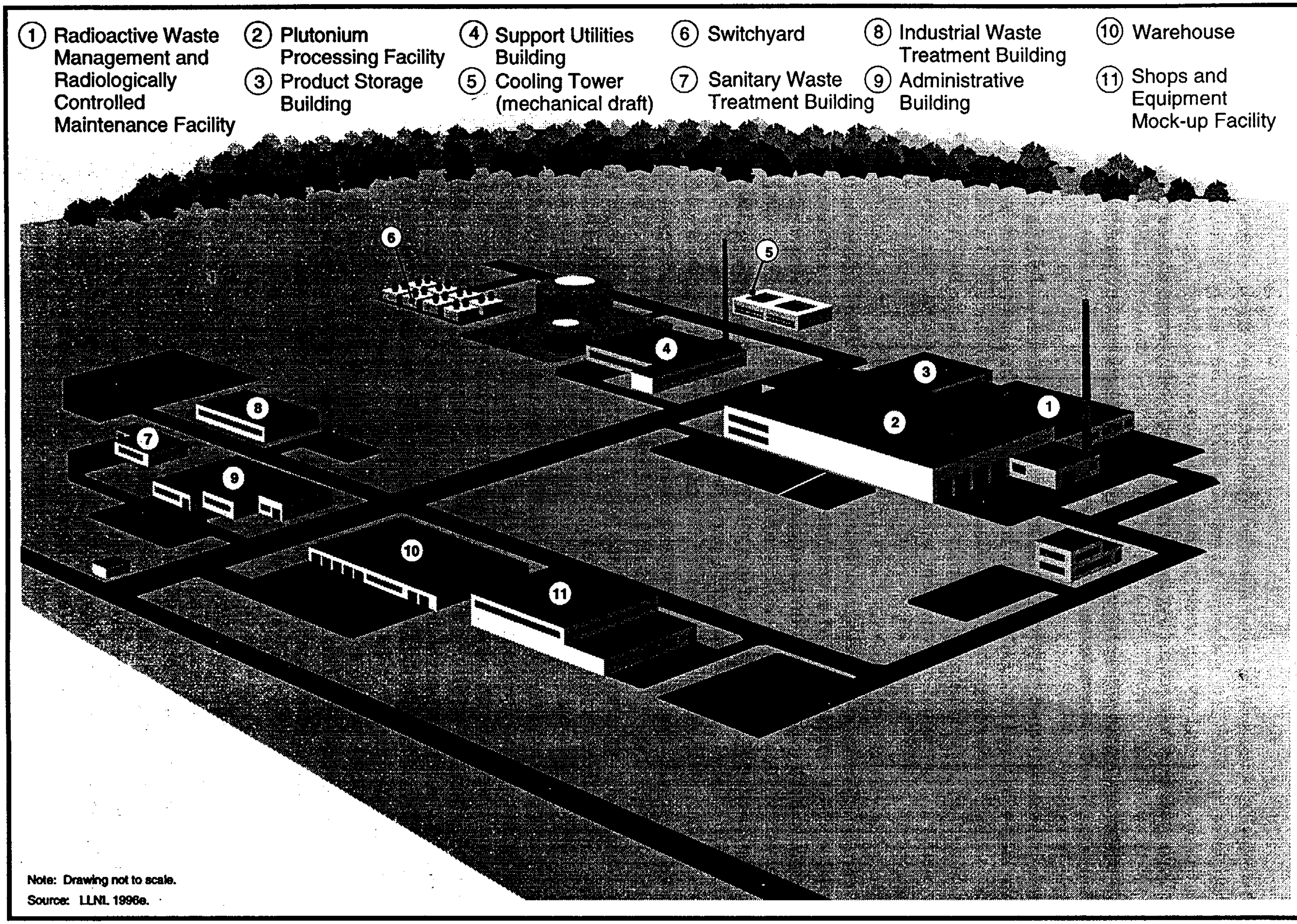
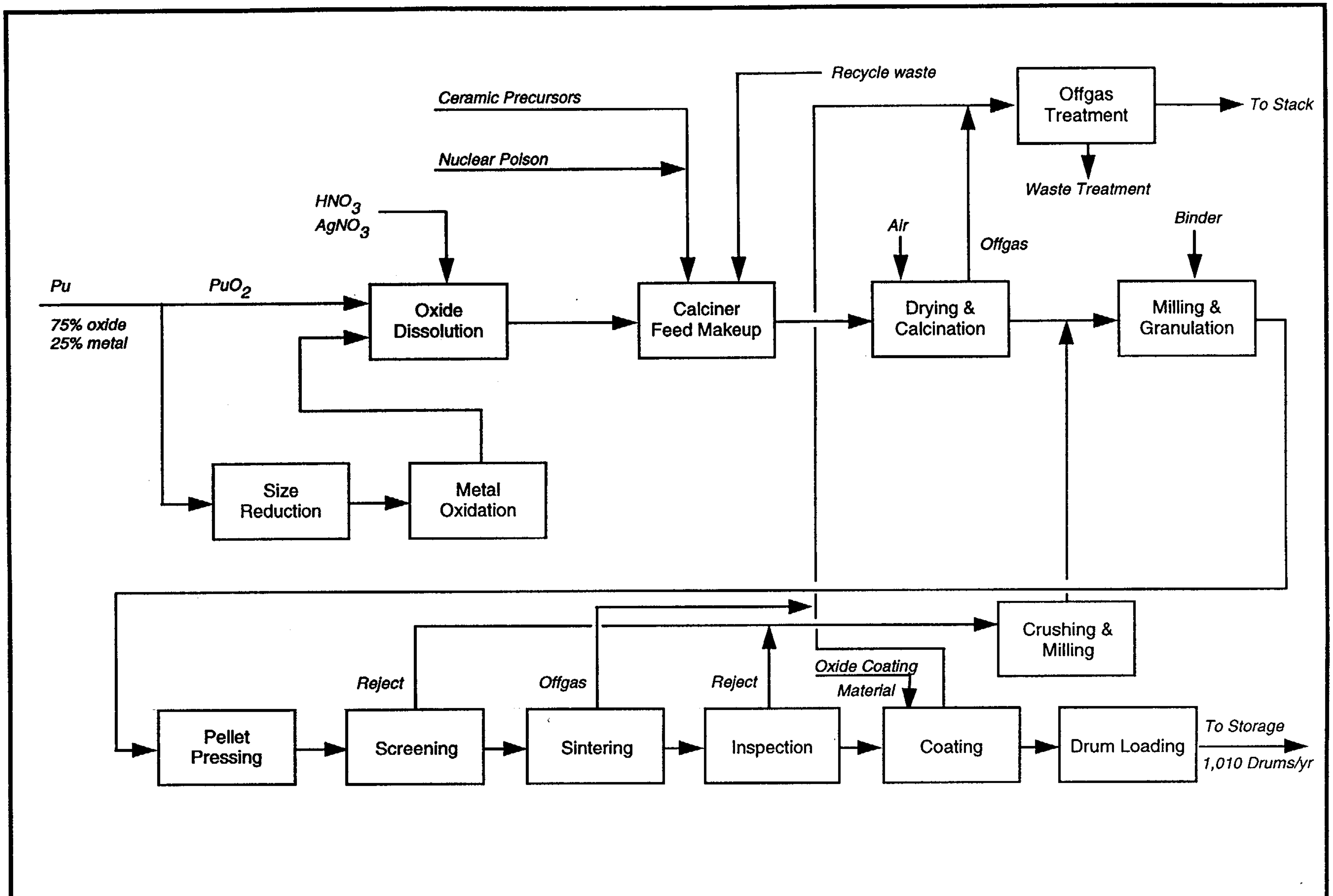


Figure 2.4.3.2.1–1. Conceptual Ceramic Immobilization Facility Site Layout—Immobilized Disposition Alternative (Perspective).



Source: LLNL 1996e.

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Figure 2.4.3.2.1–2. Ceramic Immobilization Facility Material Flow Diagram—Immobilized Disposition Alternative.

Facility waste management would also include handling and treatment operations for processing TRU, low-level, and mixed wastes, as well as industrial waste in aqueous, organic liquid, or solid forms generated from onsite operations. Waste management would be in accordance with DOE Order 5820.2A and RCRA. TRU waste generated from operations would be disposed of at WIPP (should DOE decide to operate WIPP for TRU disposal) in accordance with WIPP WAC (WIPP-DOE 069) and in accordance with decisions to be made as a result of the *Waste Isolation Pilot Plant Disposal Phase Supplemental EIS*. The waste management process flow diagram and annual quantities of wastes expected to be generated during ceramic immobilization operations are shown in Appendix E. The estimated air emissions from the ceramic immobilization processes are shown in Appendix F.

Transportation. Intrasite transport of radiological materials at the ceramic immobilization facility would be limited to the transport of shipping containers of Pu metal and oxide into the processing facility and the shipping and handling of ceramic pellets containing Pu. Intersite transportation requirements exist for material coming into the ceramic immobilization facility from offsite and material being shipped from the ceramic immobilization facility to the deep borehole complex.

2.4.3.2.2 *Deep Borehole Complex—Immobilized Disposition Alternative*

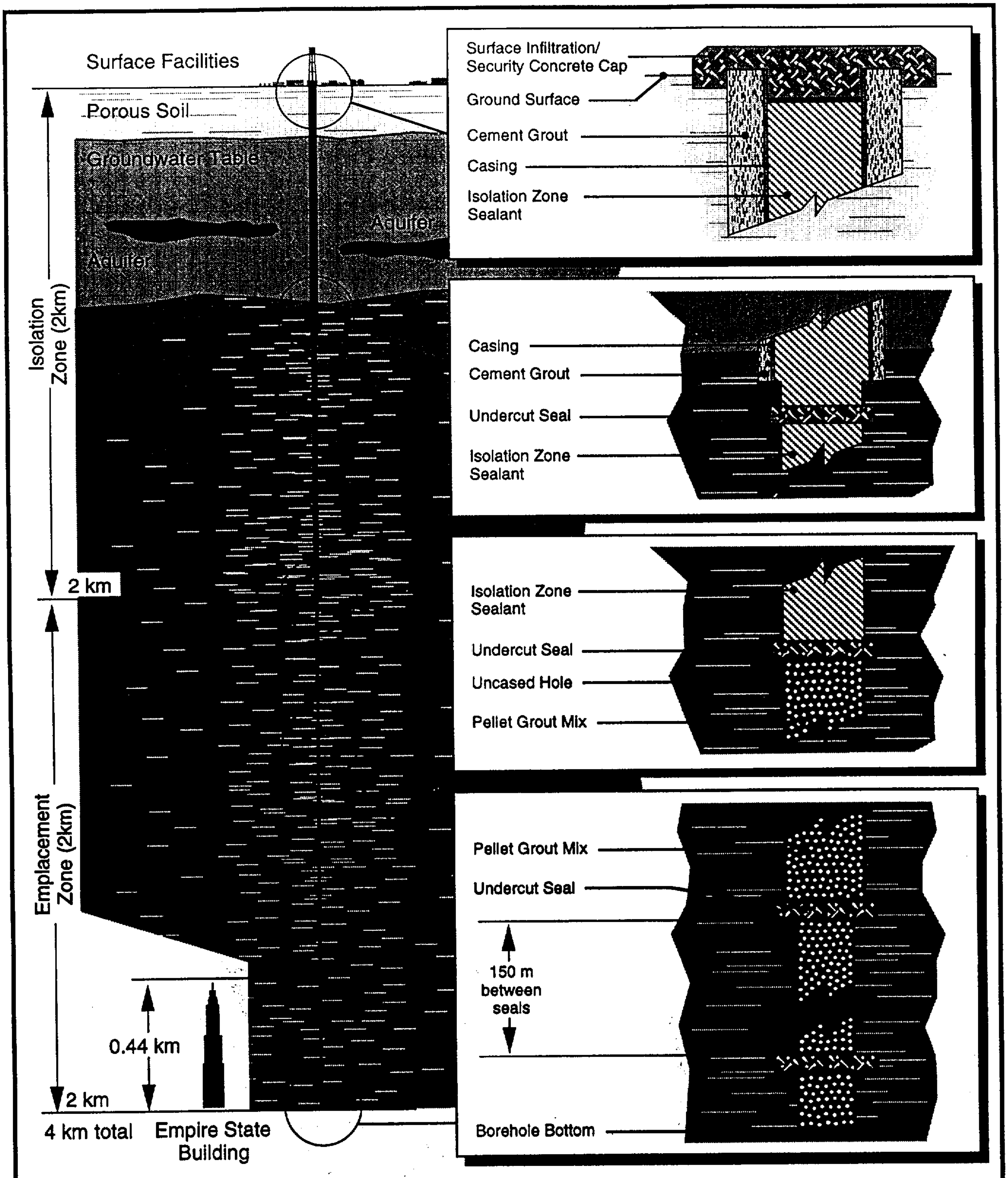
Facility Description. The facilities required for disposal after immobilization are similar to those for direct disposition (Section 2.4.3.1), with minor exceptions in the receiving and storage facilities and an additional pellet-grout mixing facility and process waste management in the emplacing facilities. As explained in Section 2.4.3.1, subsurface facilities would consist of an array of four separate boreholes, with each deep borehole separated approximately 500 m (1,640 ft) from the next nearest hole. Each deep borehole would be about 4 km (2.5 mi) in depth. Figure 2.4.3.2.2–1 shows the cross-section of a typical deep borehole, in which the upper 2 km (1.25 mi) or more of depth would pass completely through the water table. The deepest 2 km (1.25 mi) would be drilled into crystalline basement rock that is isolated from the accessible environment.

The deep borehole complex would require approximately 2,041 ha (5,043 acres) and would include the same five groups of surface facilities with the subsurface borehole array as discussed in Section 2.4.3.1. The deep borehole site layout is shown in Figure 2.4.3.2.2–2.

The deep borehole facilities would be designed to ensure that surface facilities could withstand earthquakes, high winds, and floods. The fire protection systems of the site would be in accordance with DOE orders and National Fire Protection Association Codes and Standards. The physical security, materials control and accountability, IAEA safeguards, and physical security system facilities would be consistent with protecting DOE-defined Category I and II type special nuclear materials in the deep borehole complex above ground facilities. In addition, the material would be emplaced to ensure post-emplacement downhole criticality safety.

Facility Operations. The deep borehole complex would receive ceramic pellets of immobilized Pu from the ceramic immobilization facility. Material handling of the pellets would be accomplished at the borehole site, mixing ceramic pellets with grout before emplacement. No canisters would be required to emplace the ceramic pellets into the boreholes. This operation would be done without contamination risk or radiation hazard at the deep borehole site during normal operations. As in direct disposition, the containment structure located above the deep borehole entrance would contain any Pu releases if there were accidental breakage. The material flow through the deep borehole facility is shown in Figure 2.4.3.2.2–3.

The surface processing and emplacement/sealing facilities of the deep borehole complex would operate 5 days per week, 8 hours per day, 250 days per year. The drilling facility would operate 7 days per week, 24 hours per day in two 12-hour shifts with three drilling crews. The surge rate would be handled by introducing a second 8-hour shift in the surface processing and emplacement/sealing facilities and adding a second drilling rig and additional crew, if needed, in the drilling facility. Annual utility consumptions for the deep borehole operations are listed in Appendix C, along with the chemicals consumed and the number of personnel required during deep



Note: Geologic environment—tectonically, hydrologically, thermally, and geochemically stable ancient water.
Drawing not to scale.

Source: LLNL 1996h.

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Figure 2.4.3.2.2–1. Cross-Section—Deep Borehole With Typical Arrangement With Coated Ceramic Pellets in Grout—Immobilized Disposition Alternative.

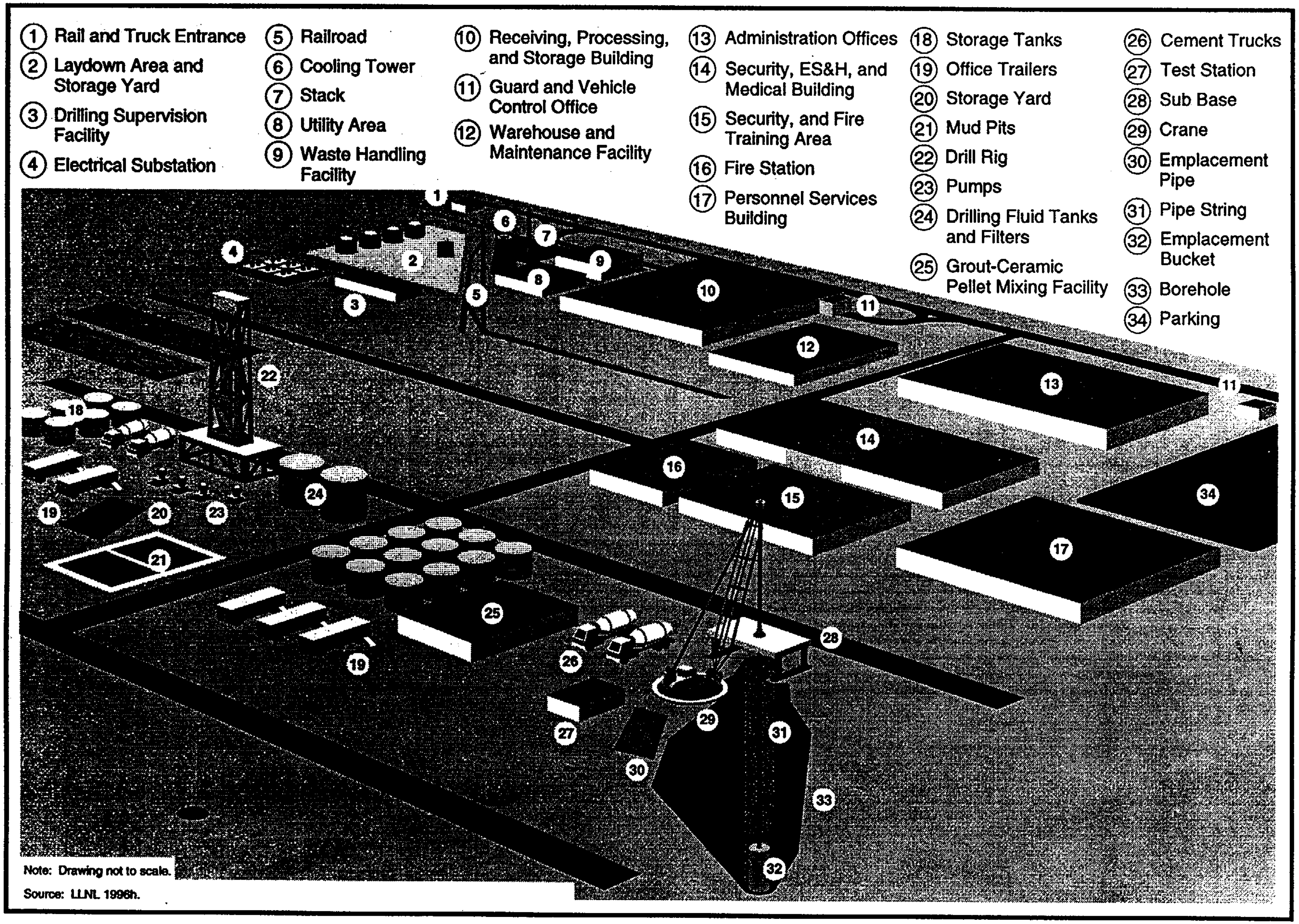

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Figure 2.4.3.2.2–2. Conceptual Deep Borehole Facility Site Layout (Perspective).

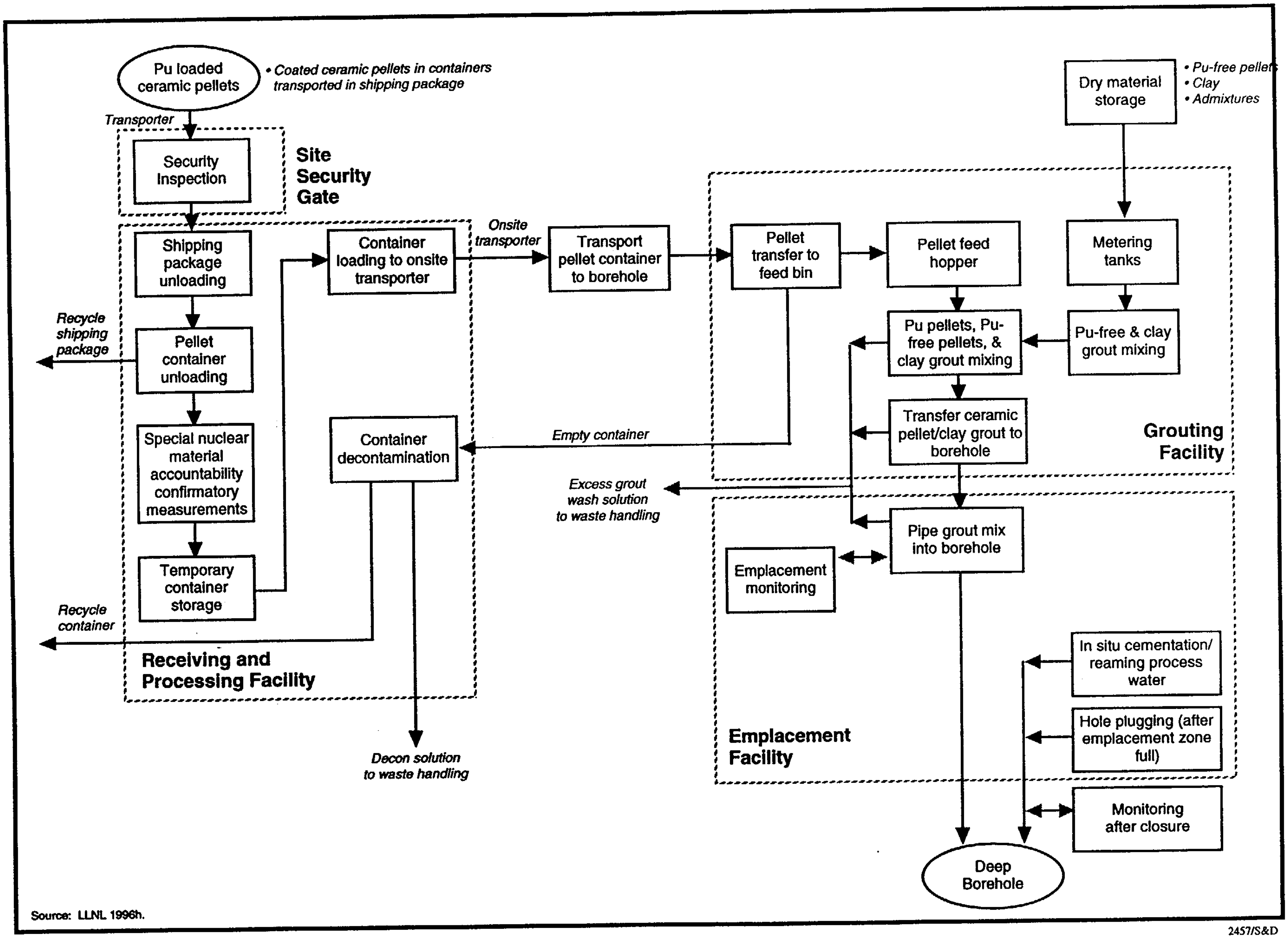


Figure 2.4.3.2.2–3. Deep Borehole Facility Material Flow Diagram—Immobilized Forms.

borehole operations. The annual water balance diagram for the deep borehole facility is shown in Appendix D. The raw water requirement for the deep borehole facility would be 138 million l/yr (36 million gal/yr).

Construction. Additional land area requirements during construction of the deep borehole complex would be 6 ha (15 acres) for construction laydown, warehousing, and temporary parking. The construction of the deep borehole facility would require 3 years and have a peak annual employment of 810 construction workers. Materials and resources consumed and employment needs during facility construction are listed in Appendix C. The peak construction year is based on the construction schedule. Estimated total quantities of solid and liquid wastes generated from activities associated with construction of new facilities are shown in Appendix E. [Text deleted.] Solid wastes would be hauled offsite for disposal during the construction period.

Waste Management. The deep borehole complex would have its own facilities to control emissions of criteria pollutants, toxic and hazardous air pollutants, and other gases emitted during operation and construction. Facility waste management would also include handling and treatment operations for processing industrial waste in aqueous, organic liquid, or solid forms generated from the onsite deep borehole operations or from other site activities. Waste management would be in accordance with DOE Order 5820.2A and RCRA. The waste management process flow diagram is shown in Appendix E as are the annual quantities of wastes expected to be generated during deep borehole operations. The estimated air emissions from the deep borehole operations are shown in Appendix F.

Transportation. Intrasite transport of radiological materials at the deep borehole would be limited to transport and handling of ceramic pellets. Intersite transportation requirements for radioactive material being shipped from the offsite ceramic immobilization facility to the deep borehole complex are shown in Section 4.4 (Table 4.4.2.2–1).

2.4.4 IMMOBILIZATION CATEGORY

Under this category of alternatives, surplus Pu would be immobilized in a subcritical matrix to create a chemically stable form for disposal in a HLW repository. The fissile material would be immobilized after mixing with radioactive isotopes from HLW or CsCl capsules to create a radiation field that could serve as a proliferation deterrent comparable to commercial spent nuclear fuel.

This PEIS analyzes the following three immobilization alternatives:

- Vitrification
- Ceramic immobilization
- Electrometallurgical treatment (GBZ form)

In addition, based upon comments from the public on the Draft PEIS there is substantial interest in the can-in-canister concept for the disposition of surplus Pu, and requests for DOE to consider its use. Accordingly, additional information on this concept is presented in Appendix O. The can-in-canister concept includes variations to the two Pu disposition alternatives for vitrification and ceramic immobilization. The can-in-canister concept could use modified existing facilities at SRS to perform the functions of the various pit disassembly/conversion, Pu conversion, and vitrification or ceramic immobilization facilities. For the vitrification can-in-canister approach, Pu would be immobilized in a glass matrix in small cans and the cans placed in stainless steel canisters which are then filled with molten HLW to serve as the radiation barrier. For the ceramic can-in-canister approach, Pu would be immobilized in a ceramic matrix in lieu of the borosilicate glass. In both cases, canisters would be filled at the DWPF and placed in lag storage at SRS until shipment to a HLW repository is possible.

2.4.4.1 Vitrification Alternative

Under this alternative, surplus Pu would be removed from storage, processed through the pit disassembly/conversion facility or the Pu conversion facility, packaged, and transported to the vitrification facility. The vitrification facility would be constructed or an existing facility would be modified, and the facility operated to accept surplus Pu in the form of metal and oxides. The Pu would be vitrified in borosilicate glass (or other types of glass) logs encased in stainless steel canisters. Also, HLW or the highly radioactive isotope Cs-137 would be mixed into the borosilicate glass to serve as a radiation barrier to theft and diversion. The Cs-137 isotope could be separated from CsCl capsules currently stored at Hanford. Gadolinium, hafnium, or another neutron absorber would be included along with the boron in the glass logs to prevent criticality. The borosilicate glass logs would be emplaced in a HLW repository (or alternative) for disposal. The absence of any RCRA-regulated hazardous materials in the final glass form would need to be demonstrated prior to acceptance into a HLW repository. The vitrified forms would remain in onsite vault-type lag storage, and would not be transported to a disposal site until such site is operational pursuant to separate appropriate NEPA documentation. A material flow diagram is presented in Figure 2.4.4.1–1. All requirements described in this section are in addition to those requirements previously described for the pit disassembly/conversion and the Pu conversion facilities.

Facility Description. The vitrification facility site layout for a new facility is shown in Figure 2.4.4.1–2. The facility data are found in Appendix B. The overall site would occupy approximately 12 ha (30 acres). All buildings would be located within a fenced area, with the Pu processing, radioactive waste management, and storage buildings contained within a PA. The mission of the key buildings in the vitrification facility follows.

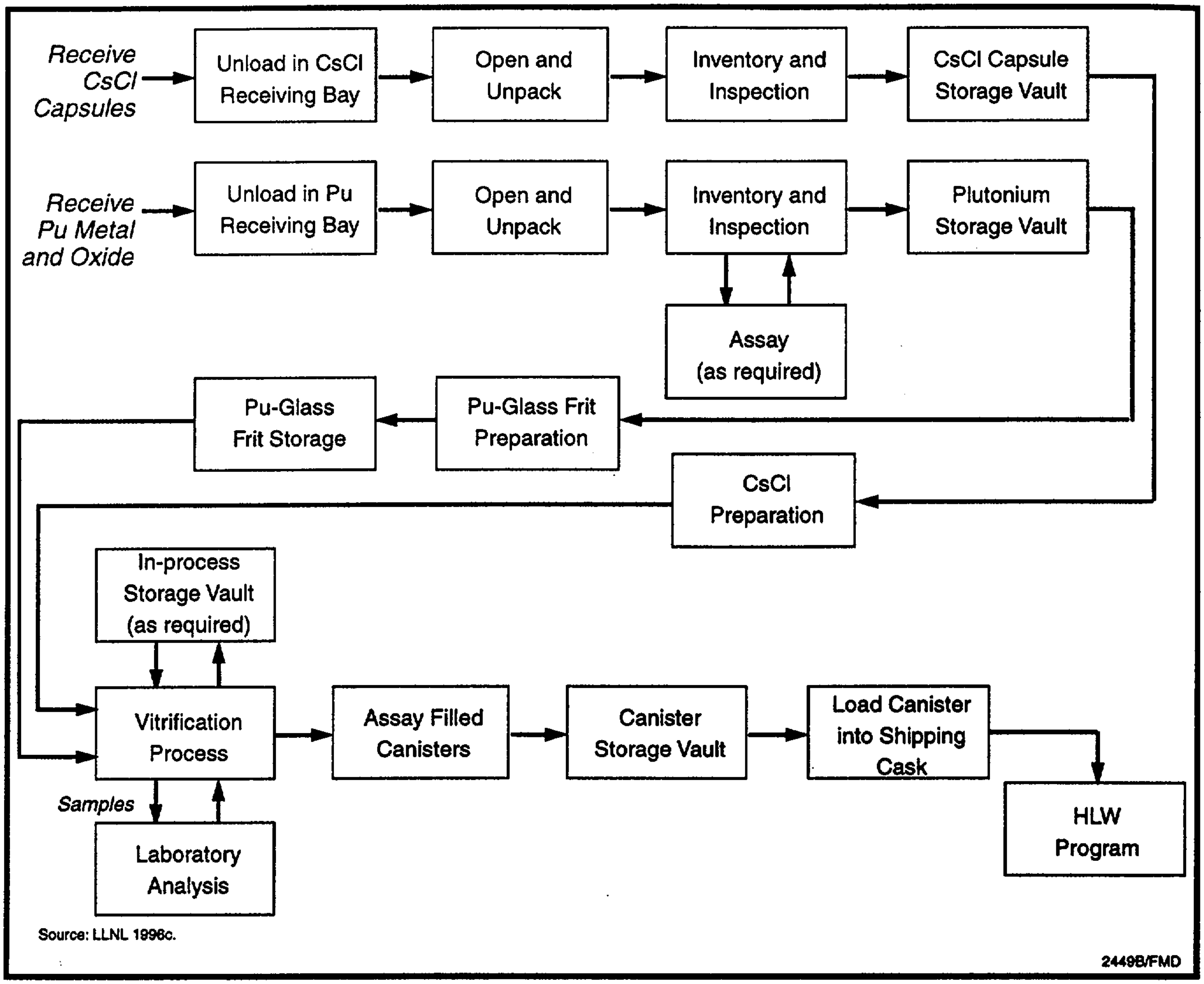
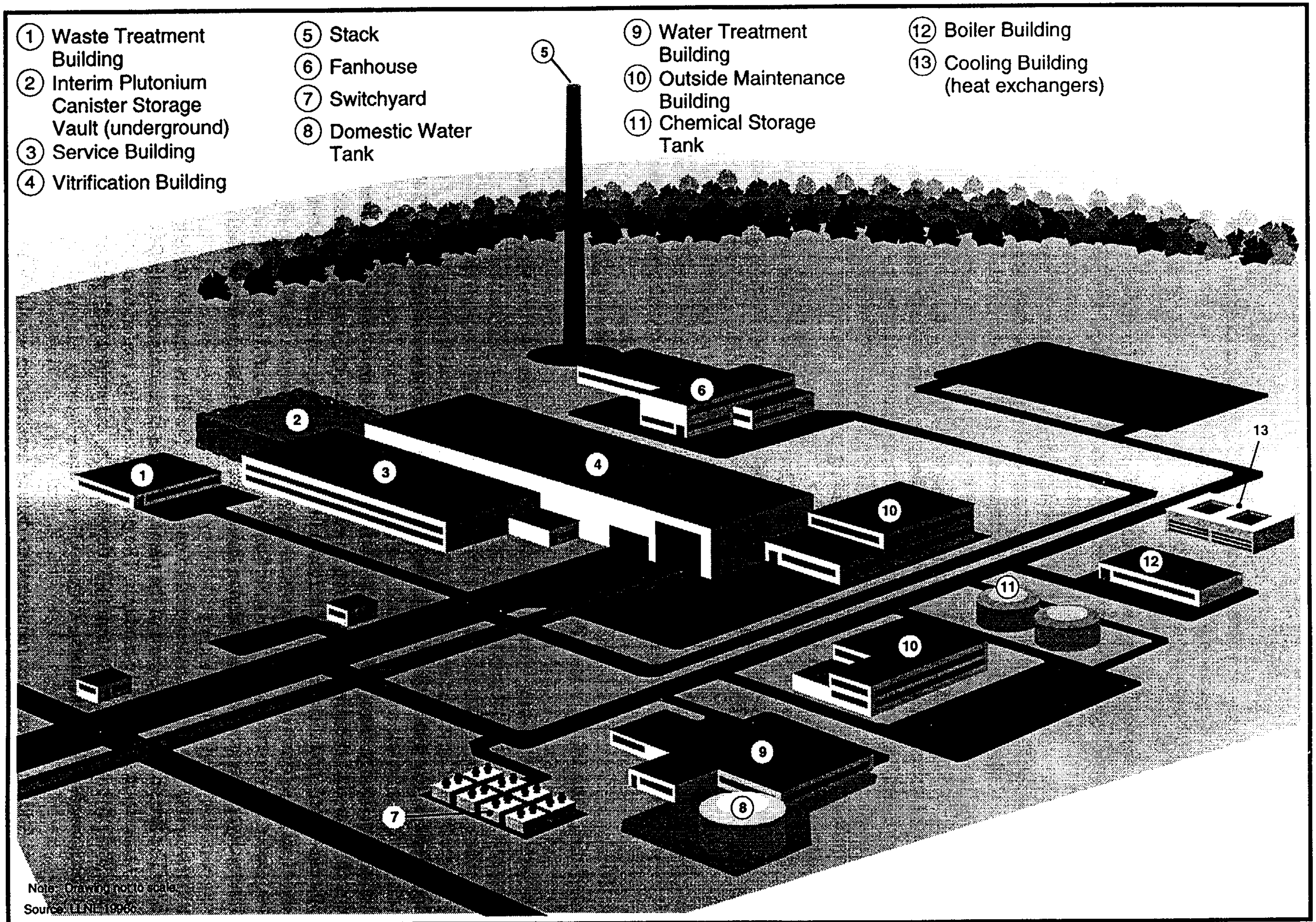


Figure 2.4.4.1–1. Vitrification Facility Material Flow Diagram.

Vitrification Building. The vitrification building would provide the following functions:

- Shipping, receipt, assay, and storage of all incoming radioactive process feed materials
- Accountability, repackaging, control, and temporary in-process remote storage of Pu, Cs, and other radioactive materials, and cold storage of chemical feed materials and borosilicate glass frit
- Conversion of incoming Pu metal and oxide to a borosilicate glass containing PuO_2 for subsequent inclusion within the vitrification process
- CsCl capsule and/or HLW processing and preparation for inclusion within the Pu-bearing borosilicate glass melt
- Processing of combined Cs-137/PuO_2 borosilicate glass melt
- Encapsulation, decontamination, and shipment of the combined Cs-137/PuO_2 borosilicate glass melt in a stainless steel cask to a repository (or alternative) for disposition



Note: Drawing not to scale.
Source: LLNL 1996c.

2450/FMD

Figure 2.4.4.1–2. Conceptual Vitrification Facility Site Layout (Perspective).

- Material accountability and temporary remote safe storage of completed and loaded casks awaiting transport to the repository or alternative

- Scrap treatment and recycle of recovered Pu and Cs for inclusion within the immobilization process

- Area access control, health physics, and personnel support

Service Building. The service building would provide the following functions:

- Central control for the main process and the crane

- Administrative support and office space, an analytical laboratory, training rooms, mock-up rooms, a lunchroom, change rooms, shops, an electrical equipment room, a utility equipment area, and warehousing

- Serve as the security access control point for the facility, providing regulated and nonregulated sections for radiation monitoring, decontamination, and access control

Interim Plutonium Canister Storage Vault. This building provides interim or lag storage after initial thermal cooling until shipment to a HLW repository.

Maintenance Building. This building would provide space for work on service vehicles and equipment that are too large for the service building.

Radwaste Building. This building would provide waste management for monitoring, treating, and handling liquid and solid radioactive wastes, industrial and chemical wastes, and sanitary/stormwater waste.

Chemical Storage Tank. This building would contain the nitric acid supply for washdown solution for decontaminating some of the process cells and equipment.

Cooling System. This building would provide cooling for water used in the immobilization process, air compressors, HVAC, and other process equipment.

Facility Operations. The vitrification facility would process surplus Pu into glass logs. A normal operating year would be 200 days. Nominal throughput in the vitrification facility would be 25 kg (55 lb) of Pu per operating day. The operating schedule assumes 3 shifts per day, 7 days per week. Time is allowed for remote maintenance, accountability, criticality control, and other functions that would shut down vitrification operations during the 165 days per year that the plant would not be expected to operate. Expected annual utility consumption, chemicals consumed, and the number of personnel required during operation are listed in Appendix C.

The raw water requirement for the vitrification facility would be approximately 250 million l/yr (66 million gal/yr). The annual water balance for the vitrification facility is provided in Appendix D.

The vitrification facility would be designed to ensure that facilities could withstand earthquakes, high winds, and floods. The fire protection systems of the plant would be in accordance with DOE Orders and National Fire Protection Association Codes and Standards. The physical security, materials control and accountability, IAEA safeguards, and physical security system facilities would be consistent with protecting DOE-defined Category I and II type special nuclear materials.

Construction. Additional land area requirements during construction would be approximately 12 ha (30 acres) for laydown areas, erosion control facilities, temporary utilities, and non-radioactive storage areas. The construction of the vitrification facility would require 5 years and have a peak annual employment of 382 construction workers. Materials and resources consumed and employment needs during construction are listed in Appendix C.

Estimated total quantities of solid and liquid wastes generated from activities associated with construction of the vitrification facility are shown in Appendix E. [Text deleted.] Solid wastes would be hauled offsite for disposal during the construction period. Waste management would be in accordance with DOE Order 5820.2A and RCRA.

Waste Management. The soil and liquid nonhazardous wastes generated during construction would include concrete and steel construction waste materials and sanitary wastewater. The steel construction waste would be recycled as scrap metal before construction was completed. The remaining nonhazardous wastes generated during construction would be disposed of by the construction contractor as part of the construction project. Uncontaminated wastewater could be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes such as adhesives, oils, and solvent rags would be packaged in DOT-approved containers and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. No soil contaminated with hazardous or radioactive constituents is expected to be generated during construction. However, if any were generated, it would be managed in accordance with site practice and all Federal and State standards.

Operation of the vitrification facility would generate TRU, low-level, hazardous, mixed, and nonhazardous wastes. The conceptual design includes waste management facilities that would treat and package all waste generated into forms that would enable staging and disposal in accordance with RCRA and other applicable statutes. TRU and mixed TRU waste would be treated and packaged to meet the WIPP WAC. These wastes would be stored awaiting shipment to a Federal repository (assumed to be WIPP, depending on decisions resulting from the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste). LLW would be treated and packaged to meet the WAC of an onsite or offsite DOE LLW disposal facility. DOE LLW treatment, storage and disposal sites that would be used would be consistent with decisions resulting from the Waste Management PEIS and NEPA reviews tiered from that PEIS. Mixed LLW would be treated and disposed of in accordance with the respective site treatment plan developed to comply with the *Federal Facility Compliance Act* of 1992 and would be in accordance with decisions made pursuant to the Waste Management PEIS and tiered NEPA documents. Hazardous wastes would be packaged in DOT-approved containers and shipped offsite to RCRA-permitted treatment and disposal facilities. Liquid nonhazardous wastes such as sanitary, utility, and process wastewater would be treated, and either discharged in accordance with site practice or reclaimed to use as makeup water when economically and/or environmentally desirable. Solid nonhazardous waste would be disposed of in permitted landfills and recycled as appropriate. The vitrified Pu (with Cs or HLW) would be stored in the lag storage facility until shipment to and disposal in a HLW repository under the NWPA. Additional details can be found in Section E.3.2.4.

Transportation. Intrasite transport of radiological materials that are not vitrified would be limited to the secure transportation of shipping containers of Pu metal and oxide, and either CsCl capsules or HLW (via pipeline). Pu metal or oxide would be delivered from offsite by SST and transported to the Pu processing complex. Vitrified borosilicate glass logs encased in stainless steel canisters would be shipped from the vitrification building to onsite lag storage. The canisters would remain in lag storage until they are shipped by rail or truck from the vitrification facility to a HLW repository for disposal.

Modified Existing Facilities. As an example of a technology variant using modified existing facilities, the can-in-canister vitrification variant using the F canyon and DWPF at SRS is described in Appendix O.

2.4.4.2 Ceramic Immobilization Alternative

Under this alternative, surplus Pu would be removed from storage, processed through the pit disassembly/conversion facility or the Pu conversion facility, packaged, and transported to the ceramic immobilization facility. The ceramic immobilization facility would be constructed, or an existing facility would be modified, and the facility would be operated to accept surplus Pu in the form of metal and oxides. The Pu would be immobilized within a titanate-based ceramic matrix, formed into disks, and the disks would be encased in stainless steel canisters. Also, the highly radioactive isotope Cs-137, would be included into the ceramic matrix to serve as a radiation barrier to theft and diversion. The Cs-137 could be provided from CsCl capsules currently stored at Hanford or from HLW. Gadolinium, hafnium, or another neutron absorber also would be included in the ceramic matrix to prevent criticality. Canisters with the ceramic immobilized disks would be emplaced in a HLW repository (or alternative) for disposal. The absence of any RCRA-regulated hazardous materials in the final ceramic form would need to be demonstrated prior to acceptance into a HLW repository. The canisters would remain in onsite vault-type lag storage and would not be transported to a disposal site until the site is operational pursuant to separate appropriate NEPA documentation. A material flow diagram can be found in Figure 2.4.4.2–1. All requirements shown in this section are in addition to those requirements previously described for the pit disassembly/conversion and the Pu conversion facilities.

Facility Description. The ceramic immobilization facility site layout for a new facility is shown in Figure 2.4.4.2–2. The facility data is found in Appendix B. The overall site would occupy approximately 12 ha (30 acres). The primary Pu handling buildings would be located within a double security fenced area. The mission of key facilities follows.

Plutonium Processing Building. The Pu processing building would provide the following functions:

- Shipping, receiving, accountability, repackaging, control, and temporary in-process storage of Pu, Cs-137, and other radioactive materials, cold chemical feed materials, ceramic precursor, titanium metal, and bellows
- Processing, process control, decontamination, mechanical and electrical support, equipment maintenance, analytical laboratory analysis, and clean equipment maintenance
- Remotely operated ceramic immobilization processing and in-process storage of Pu and Cs
- Scrap treatment and recycling of Pu from contaminated process materials
- Area access control, health physics, and personnel support

Radwaste Management Building. This building would monitor, process, treat, and handle radioactive wastes, including low-level, TRU, and mixed wastes, in gaseous, liquid, and solid form.

Hot Maintenance Shop. This building would provide facilities for the maintenance and repair of process equipment from the Pu processing facility, the radiation waste management building, and the canister storage building. Shop areas are provided for receiving and decontaminating equipment, disassembly and repair of equipment, machining, repair of electrical equipment and controls, and equipment testing.

Canister Storage Building. This building would provide canister storage for 1 year of canister production and space for an additional 9 years capacity.

Facility Operations. The ceramic immobilization facility would process surplus Pu and Cs-137 into compressed ceramic bellows shaped like flat disks. Twenty ceramic bellows would be stacked inside stainless steel canisters which then would be sealed. A normal operating year would be 200 days. Nominal throughput in

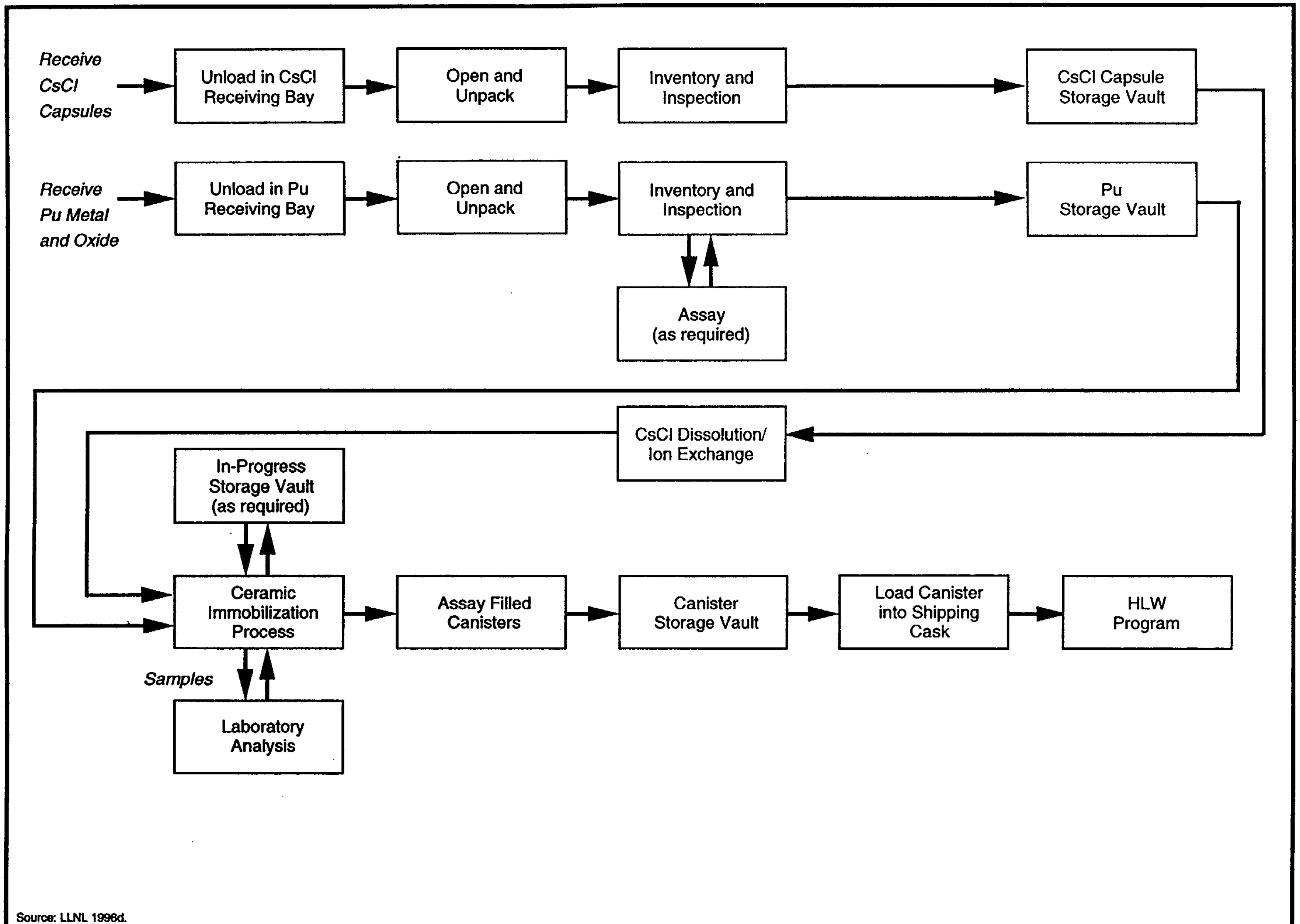


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Figure 2.4.4.2–1. Ceramic Immobilization Facility Material Flow Diagram.

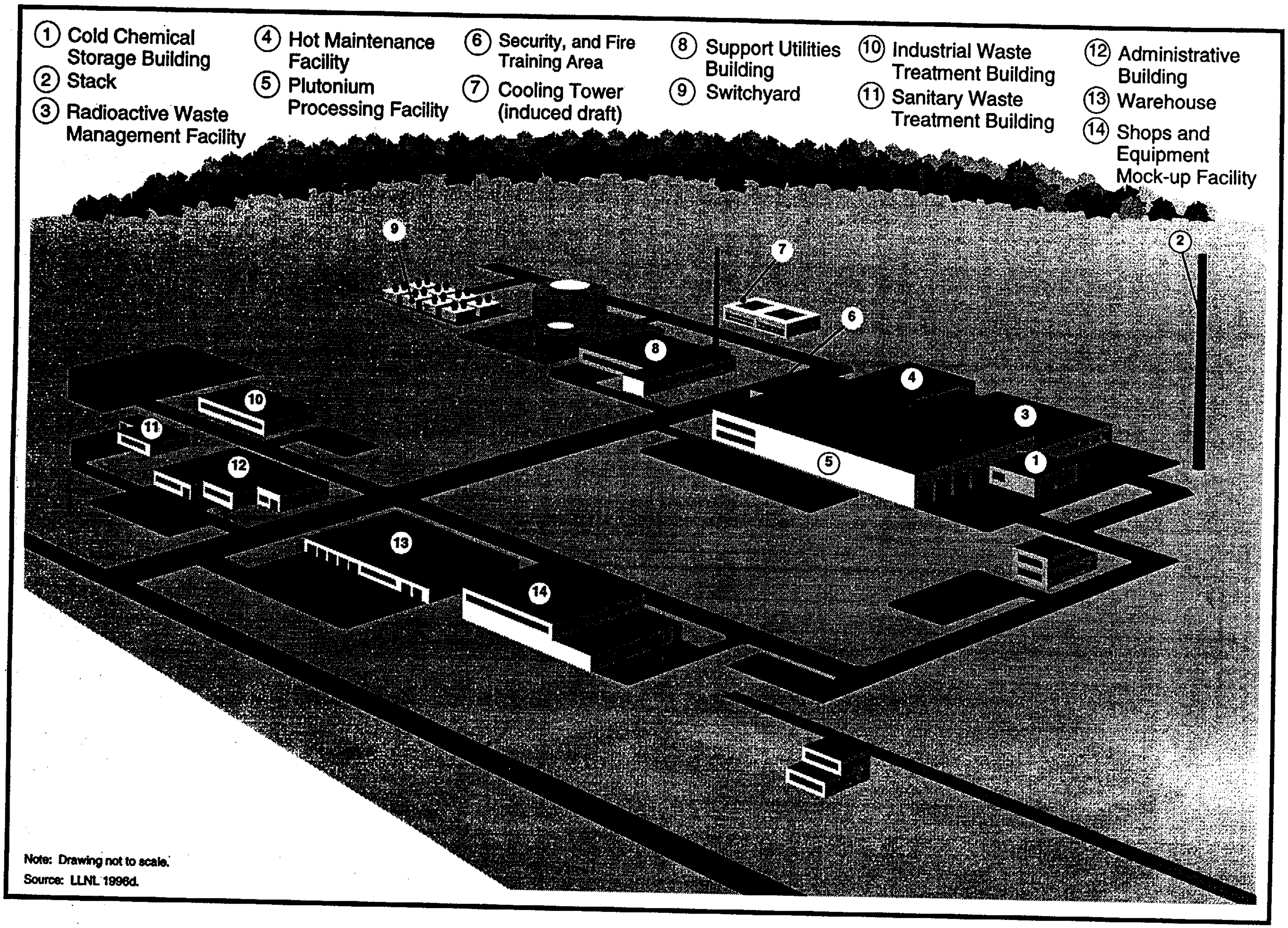


Figure 2.4.4.2–2. Conceptual Ceramic Immobilization Facility Site Layout (Perspective).

the ceramic immobilization facility would be 25 kg (55 lb) of Pu per operating day. The operating schedule assumes 3 shifts per day, 7 days per week. Time is allowed for remote maintenance, accountability, criticality control, and other functions that would shut down immobilization operations during the 165 days per year that the plant would not be expected to operate.

Expected annual utility consumption, chemical consumption, and personnel requirements during operation are listed in Appendix C. The raw water requirement for the ceramic immobilization facility would be approximately 250 million l/yr (66 million gal/yr). The annual water balance for the ceramic immobilization facility is shown in Appendix D.

The ceramic immobilization facility would be designed with features to prevent, control, and mitigate the consequences of potential accidents. The facility design uses a defense-in-depth approach to protect workers, the public, and the environment from release of radioactive or hazardous materials. Facilities would be designed to ensure that they would withstand earthquakes, high winds, or floods. The fire protection systems of the plant would be in accordance with DOE Orders and National Fire Protection Association Codes and Standards. The physical security, materials control and accountability, IAEA safeguards, and physical security system facilities would be consistent with protecting DOE-defined Category I and II type special nuclear materials.

Construction. Additional land area requirements during construction would be approximately 8 ha (20 acres) required for laydown areas, temporary utilities, and storage areas. The construction of the ceramic immobilization facility would require 5 years and have a peak annual employment of 1,000 construction workers. Projected material and resource consumption and employment needs during construction are listed in Appendix C.

Estimated total quantity of solid and liquid wastes generated during construction of the ceramic immobilization facility is shown in Appendix E. The waste generation data are based on factors from historic data on construction area size and construction labor force estimates. Solid wastes would be hauled offsite for disposal during the construction period. Waste management would be in accordance with DOE Order 5820.2A and RCRA.

Waste Management. The solid and liquid nonhazardous wastes generated during construction would include concrete and steel construction waste materials and sanitary wastewater. The steel construction waste would be recycled as scrap metal. The remaining nonhazardous wastes generated during construction would be disposed of by the contractor as part of the construction project. Uncontaminated wastewater could be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Nonhazardous wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes such as adhesives, oils, and solvent rags would be packaged in DOT-approved containers and shipped to RCRA-permitted treatment, storage, and disposal facilities. No soil contaminated with hazardous or radioactive constituents is expected to be generated during construction. However, if any were generated, it would be managed in accordance with site practice and all Federal and State standards.

Operation of the ceramic immobilization facility would generate TRU, low-level, hazardous, mixed, and nonhazardous wastes. The conceptual design includes waste management facilities that would treat and package all waste generated into forms that would enable staging and disposal in accordance with RCRA and other applicable statutes. TRU and mixed TRU waste would be treated and packaged to meet the WIPP WAC. These wastes would be stored awaiting shipment to a Federal repository (assumed to be WIPP, depending on decisions resulting from the supplemental EIS for the proposed continued phased development of WIPP for disposal of TRU waste). LLW would be treated and packaged to meet the WAC of an onsite or offsite DOE LLW treatment, storage and disposal sites. DOE LLW treatment, storage and disposal sites that would be used would be consistent with decisions resulting from the Waste Management PEIS and NEPA reviews tiered from that PEIS. Mixed LLW would be treated and disposed of in accordance with the respective site treatment plan which was developed to comply with the *Federal Facility Compliance Act* and with decisions made pursuant to the Waste Management PEIS. Hazardous wastes would be packaged in DOT-approved containers and shipped to RCRA-permitted treatment and disposal facilities. Liquid nonhazardous wastes such as sanitary, utility, and process wastewater would be reclaimed to use as makeup water when economically and/or environmentally desirable. Solid nonhazardous waste would be disposed of in permitted landfills and recycled as appropriate. The immobilized Pu (with Cs or HLW) would be stored in the lag storage facility until shipment to and disposal in a HLW repository under the NWPA. Additional details can be found in Section E.3.2.5.

Transportation. Intrasite transport of radiological materials that are not immobilized would be limited to the secure transportation of shipping containers of Pu metal and oxide, and either CsCl capsules or HLW (via pipeline). Pu metal or oxide would be delivered from offsite by SST and transported to the Pu processing complex. Canisters, with immobilized Pu, would be transported intrasite to lag storage. The canisters would remain in lag storage until they are shipped by rail of truck from the ceramic immobilization facility to a HLW repository for disposal.

Modified Existing Facilities. As an example of a technology variant using modified existing facilities, the can-in-canister ceramic immobilization variant using the F canyon and DWPF at SRS is described in Appendix O.

2.4.4.3 Electrometallurgical Treatment Alternative

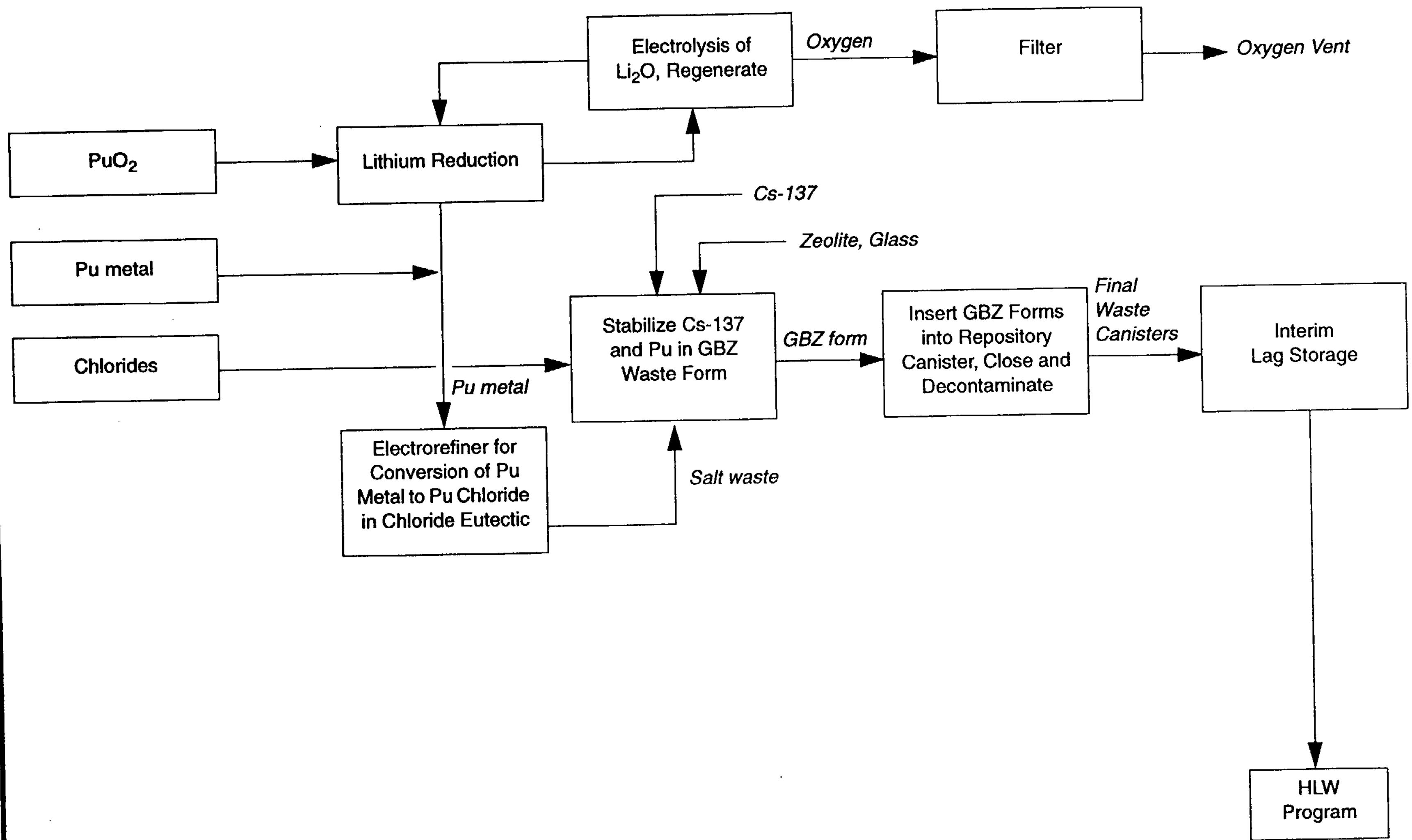
Under this alternative, surplus Pu would be removed from storage, processed through the pit disassembly/conversion facility or Pu conversion facility, packaged and transported to new or modified facilities for electrometallurgical treatment. The electrometallurgical treatment process could immobilize surplus fissile materials into two waste forms: a GBZ and/or a metal ingot. With the GBZ material, the Pu is in the form of a stable, leach-resistant mineral that is incorporated in durable glass materials. The processes to produce the metal waste form result in the larger accident impacts and are used as the basis for assessing potential accident consequences and risks. Although this alternative could be conducted at other DOE sites, the ANL-W site is described as being representative for analysis. If this alternative is selected at ROD, additional construction impacts could occur if implemented at a site other than ANL-W.[19]

With the electometallurgical treatment to immobilize the material into a GBZ form, Pu oxide or Pu would be converted to chlorides, dissolved in a molten salt solution, sorbed on zeolites, and then immobilized in a GBZ waste form. The Cs-137 isotope and HLW would be used to provide a radiation barrier. The Cs-137 isotope could come from processed CsCl capsules currently stored at Hanford. A material flow diagram is presented in Figure 2.4.4.3–1. The absence of any RCRA-regulated hazardous material in the final GBZ form would need to be demonstrated prior to acceptance into a HLW repository.

Facility Description. A facility site layout, using ANL-W as a representative site, showing the locations of the most relevant buildings is provided in Figure 2.4.4.3–2. The pertinent parameters for the major structures and other support buildings and areas, relevant to the immobilization activities, are detailed in Appendix B. A brief description of the primary facilities for this immobilization process (using ANL-W as a representative site) are as follows:

Fuel Cycle Facility (FCF) (Building No. 765). This area would house some of the major equipment that could be used in producing the GBZ waste form. This equipment would include an electrorefiner, a casting furnace,

[19] DOE has recently issued a FONSI (61FR25647) and decision to proceed with the demonstration of the electrometallurgical treatment process at ANL-W at INEL for processing up to 125 spent fuel assemblies from Experimental Breeder Reactor II (EBR-II) (100 driver and 25 blanket assemblies). The National Research Council performed *An Evaluation of the Electrometallurgical Approach for Treatment of Excess Weapons Plutonium,* (National Academy Press, Washington, D.C., 1996). The results of this evaluation will be considered in DOE's decisionmaking process for Pu disposition.



Source: LLNL 1996b.

Figure 2.4.4.3–1. Electrometallurgical Treatment, Glass-Bonded Zeolite Waste Form.

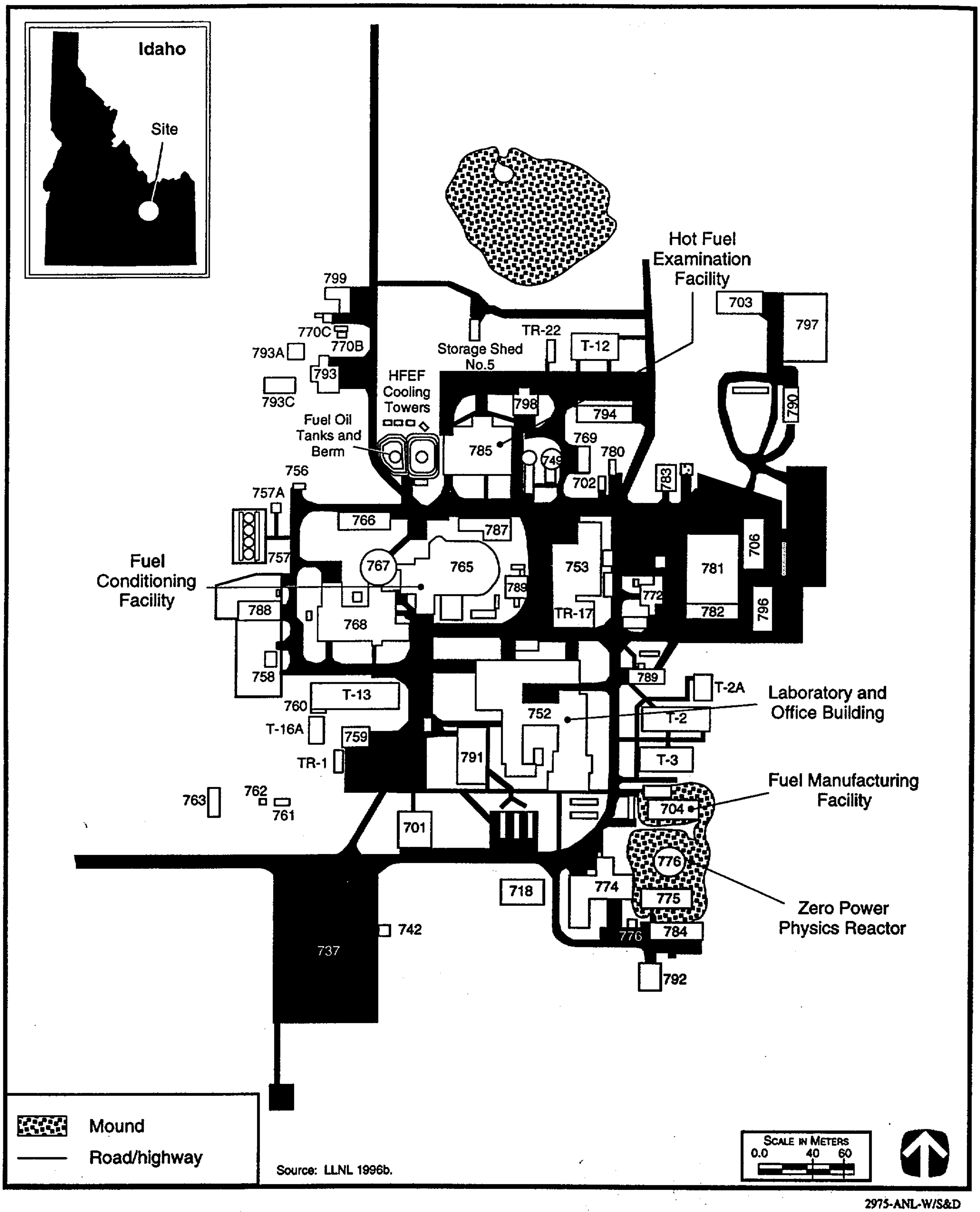


Figure 2.4.4.3–2. Detailed Layout of the Argonne National Laboratory-West Site.

and a cathode processing system. The facility is composed of the FCF process building, the Safety Equipment Building, the interconnecting tunnel, the safety equipment pit, and exhaust gas stack.

Safety Equipment Building (No. 709). This building houses the safety-grade diesel generating and emergency exhaust systems.

Hot Fuel Examination Facility (HFEF) (No. 785). This facility contains hot cells for the remote handling of materials and may be used for the temporary storage of the product waste forms. The HFEF is capable of handling large, highly radioactive objects such as spent fuel elements from commercial light water reactors.

Zero Power Physics Reactor (No. 776) The cell and fuel storage vault would be used for temporary storage of incoming fissile materials. The facility is divided into an area under an earthen mound where all fissile materials would be stored and a support wing that contains rooms with monitoring and control instruments, offices and other support systems.

The reactor cell, which currently houses the ZPPR, is a 15.25-m (50-ft) diameter circular room with floor and walls of reinforced concrete. An air system that once provided cooling for the critical facility and maintained a negative pressure relative to the surroundings would be used to maintain a negative pressure in the two storage areas and provide cooling for product ingots with high gamma or neutron emissions. The analytical laboratory in this facility is fully equipped to support the immobilization activities.

Laboratory and Office Building (No. 752). This building contains analytical facilities and offices for the supporting technical and administrative personnel.

Fuel Manufacturing Facility (No. 704). This is a secure facility where glovebox facilities are located.

Radioactive Scrap and Waste Facility (No. 771). This facility provides temporary storage for radioactive and hazardous wastes. It is an RCRA Class B facility. The Radioactive Waste Management Complex (RWMC) at INEL is also available for interim waste storage.

ANL-W has in place, approved safeguard and security systems for the quantities of weapons-usable Pu materials to be located onsite. The site is equipped with a vehicle control station for positive control of all vehicular traffic to and from the ANL-W facilities that would be used for operations with surplus Pu-bearing materials.

Facility Operations. The Pu feed would consist of a combination of metal, oxides, and chloride salts. Immobilization operations would be performed 18 hours per day for 200 days per year. Nominal throughput in the electrometallurgical treatment facility would be 25 kg (55 lbs) Pu per operating day. The fissile materials would be shipped in and placed in lag storage at rates adequate to maintain the processing rate. Two to three months of inventories of feed materials would be stored onsite. The Pu loading in the GBZ waste form would be identified during the R&D program, but is estimated at 5 percent by weight of Pu. The package size is assumed to be up to 400 kg (880 lbs). Actual size would depend largely on criticality considerations. Neutron absorbers would be added to the waste form to decrease the probability of a criticality event.

During operation of the facility, only a minor increase in resources would be required to implement the Pu disposition mission since existing facilities, equipment, and personnel would be used. Additional personnel would be required to take care of operating the added equipment and to satisfy the increased security and safeguards requirements. The only additional utilities required would be electricity for the new process furnaces and a small increase in water consumption due to the increased number of employees and cooling requirements. The chemicals that would be consumed during operation include some process salt required for the material processed and some added zeolite and glass. Appendix C provides summary listings of the annual utilities, chemical resources, and employment operational requirements for this alternative.

No process water would be required. A modest increase in water would be required for a nominal 20-percent increase in the site population and cooling tower makeup water. A simplified water balance diagram is presented in Appendix D.

Construction. No new construction would be required to perform the immobilization operations with this alternative at ANL-W. The FCF was completely refurbished and upgraded in 1994 to modern standards appropriate for the immobilization project. Minor modifications would be expected to be required for the HFEF and ZPPR. The Pu immobilization effort would require additional equipment not currently in place in these facilities. Existing mock-up areas would be adequate for pre-installation checkout and qualification of this equipment, with the principal mock-up area located in the northeast corner of the FCF outside the MAA. The additional process equipment would be shipped in from offsite and installed in existing space. The materials and resources consumed and employment required during the modification period are given in Appendix C.

Waste Management. [Text deleted.] The Pu disposition mission would not significantly increase the quantity of liquid and solid wastes. The mass of the product HLW would be increased by the amount of Pu, zeolite, and Cs added. For the Pu disposition mission, the TRU, low-level, and other nonhazardous waste quantities would be in proportion to the processing rate. Due to operational controls to minimize the amount of hazardous materials used in conducting facility operations, the amount of mixed and hazardous wastes generated would be minimized. The amount of nonhazardous (sanitary) wastes would be based upon a water usage factor and the number of additional employees needed for the Pu disposition operations. An estimate of the annual waste volumes produced as a result of the disposition operations is presented in Appendix E. The radioactive emissions are conservatively based on the estimated releases from the FCF. Estimates of annual emissions during operations are provided in Appendix F. Waste facility modifications/construction would not be required to support the Pu disposition mission. Estimates of construction-related wastes and incremental operations emissions associated with this alternative are presented in Appendices E and F. Modifications to existing permits may be required to implement the Pu disposition mission.

Transportation. The periodic shipment of radioactive process feed materials and packaged waste products would be required to support the Pu disposition mission. Pu metal or oxide would be delivered by SST and stored in the ZPPR vault upon arrival at the site. Cesium feed would be shipped from Hanford as CsCl capsules and received and stored onsite in the HFEF.

When needed for processing, containers with the Pu feed would be transported to the FCF or HFEF process cell. Since the CsCl capsules would be stored at the HFEF, no intrasite transport of this material would be necessary. Following processing, the GBZ waste forms with the immobilized Pu would be placed in canisters for onsite lag storage until shipment to a HLW repository (or alternative) is possible.

2.4.5 REACTOR CATEGORY AND COMMON ACTIVITIES

The alternatives under the Reactor Category considered in this PEIS would convert surplus Pu to MOX fuel for use in reactors. The irradiated MOX fuel would reduce the proliferation risks of the Pu material, and the reactors would generate electricity. The spent nuclear fuel generated from using the MOX fuel would be sent to an HLW repository or, if a foreign reactor is used, disposed of in a foreign spent fuel program.

These reactor alternatives include the following:

- Existing LWRs
- Partially Completed LWRs
- Evolutionary LWRs
- CANDU Reactors

Before surplus Pu can be used as reactor fuel, a conversion process is required to transform the Pu, in its various forms, into MOX fuel. The following common supporting facilities are required to process Pu, in its current forms, into MOX fuel:

- Pit disassembly/conversion facility
- Pu conversion facility
- MOX fuel fabrication facility

Under the various Reactor Alternatives, surplus Pu would be removed from storage, processed through the pit disassembly/conversion facility or Pu conversion facility, transported to the MOX fuel fabrication facility, converted into a MOX fuel, transported to the reactor site, and used as fuel for the reactor.

The Storage and Disposition PEIS addresses the disposition of surplus Pu. In the TSR PEIS (final version issued October 1995), there is an option for a multipurpose reactor that could produce tritium, use Pu in reactor fuel, and generate revenue through the production of electricity. Environmental analysis of the multipurpose reactor is included in the TSR PEIS. On December 6, 1995, the Secretary of Energy made the decision (60 FR 63878) that the future source of tritium would either be from a purchased reactor or irradiation in a commercial reactor or the accelerator production of tritium. The multipurpose reactor was preserved as an option for future consideration. DOE is also evaluating the operation of the FFTF at Hanford for its possible role as a multipurpose reactor in meeting future tritium requirements. Additional information can be found in Appendix N.

2.4.5.1 Mixed Oxide Fuel Fabrication

Mixed oxide fuel fabrication is common to all four reactor alternatives because each reactor would use Pu in the form of MOX fuel. In the 1970s, MOX fuel fabrication was conducted in a number of U.S. and foreign facilities on a laboratory or pilot line scale. However, today only the foreign MOX fuel fabrication programs continue. Proliferation concerns and unfavorable economics of Pu use resulted in a U.S. decision, in late 1970s, to defer indefinitely commercial reprocessing and recycling of the Pu produced in U.S. nuclear power programs. Consequently, MOX fuel fabrication facilities do not currently exist in the United States.

Converting surplus Pu into MOX fuel for use in a reactor would be consistent with U.S. nonproliferation policy since while the Pu is in the MOX fuel form it would be subject to high standards of safeguards and security and would be available for inspection by the IAEA. After use in a reactor, the Pu would meet the Spent Fuel Standard for proliferation resistance.

Because the United States does not have a MOX fuel fabrication facility or capability, a dedicated facility would likely have to be constructed or modified at a U.S. Government or existing commercial fuel fabricator's site. To provide MOX fuel until a domestic fuel fabrication plant is available, fuel for initial lead test assemblies and other MOX fuel may be produced by existing facilities in Europe on a short-term basis.

In accordance with the Preferred Alternative for surplus Pu disposition, the MOX fuel fabrication facility could be located at either Hanford, INEL, Pantex, or SRS. Further tiered NEPA review will be conducted to examine alternative locations, including new and existing facilities at these four sites, should the Preferred Alternative be selected at the ROD.

Facility Description. The MOX fuel fabrication facility would accept surplus Pu material in oxide form from the pit disassembly/conversion facility and the Pu conversion facility and fabricate mixed PuO_2-uranium dioxide (UO_2) fuel. The fabrication process would take PuO_2, purify it to meet MOX PuO_2 feed specifications, and blend it with UO_2 (this UO_2 may contain natural or depleted uranium) and any required burnable neutron absorbers. The MOX would be formed into pellets, loaded into fuel rods,[20] and assembled into fuel bundles. The facility would have storage capacity for approximately a 1-year supply of fuel bundles awaiting shipment to any of the various disposition reactors. Figure 2.4.5.1–1 presents a process flow diagram.

The total disturbed land area for the MOX fuel fabrication facility would be approximately 81 ha (200 acres), plus a 1.6-km (1-mi) wide buffer zone around the facility. All facility buildings would be located within a fenced area. A PA containing the fuel fabrication, waste management, receiving and storage, chemical storage, and cold support and utilities buildings would be surrounded by an appropriate perimeter security system. Within the PA, an MAA would connect the receiving and storage, fuel fabrication, and waste management buildings.

Figure 2.4.5.1–2 provides a facility site layout. The type of construction and the footprint area required for each building can be found in Appendix B. The mission description of these buildings follows.

Receiving and Storage Building. Process materials and supplies would be received and stored here. This building would house the Pu lag storage vault.

Fuel Fabrication Building. The MOX fuel fabrication processes would be housed here.

Waste Management Building. This building would process, temporarily store, ship, and provide control and accountability for all solid, liquid, contaminated, or uncontaminated generated wastes. The waste processes and handling areas would be segregated by waste form.

Cold Support and Utilities Building. This building would house HVAC, electrical, water, and natural gas distribution for the facility. It would also provide a machine shop and storage facilities for nonradioactive or uncontaminated materials.

General Administration and Security Building. This building would provide office and support space for the site.

Fire Station. This building would provide augmented support to the site (in addition to local services) for immediate response to fire and medical emergencies.

Chemical Storage Area. This area would provide space for chemical storage tanks that supply the buildings and processes in the PA.

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[20] The term "rods" used herein means LWR rods or CANDU elements.

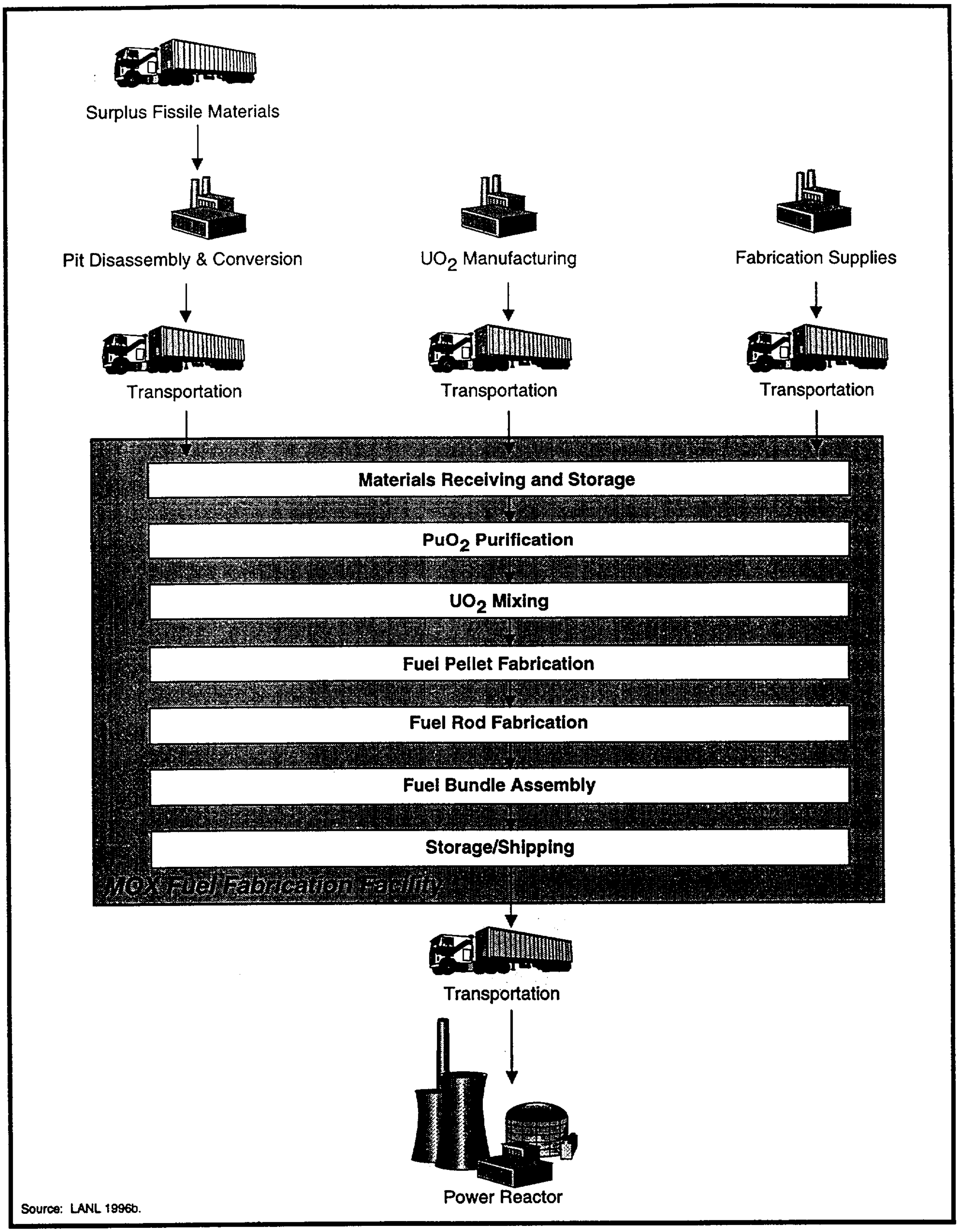

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Figure 2.4.5.1–1. Mixed Oxide Fuel Fabrication Facility Material Flow Diagram.

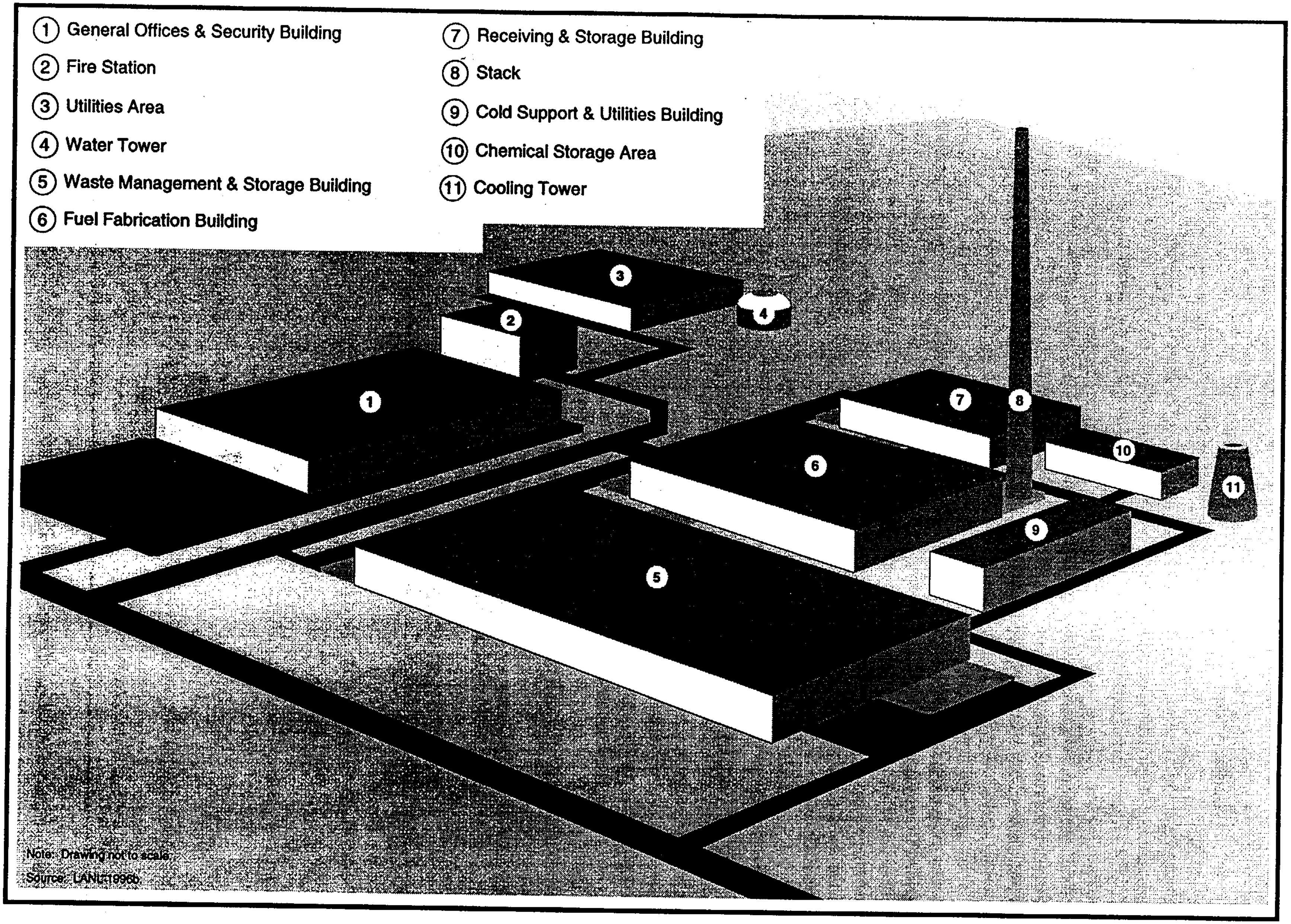

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Figure 2.4.5.1–2. Conceptual Mixed Oxide Fuel Fabrication Facility Site Layout (Perspective).

Utilities Area. This area would be the entrance and metering point for electrical, natural gas, and water supplies. The electrical substation, emergency generator(s), and associated switching equipment would be located in this area.

Facility Operations. Initial operations would begin 1 year before associated reactor operations using the MOX fuel. Based on these data, a campaign for the disposition of surplus Pu can be examined. As shown in Table 2.4.5.1–1, a Pu throughput of between 2.9 t/yr (3.2 tons/yr) and 5.0 t/yr (5.5 tons/yr) would be achievable. The average fraction of input weapons-grade Pu would determine the throughput required of the fuel fabrication facility and, consequently, facility size and environmental impact. The MOX fuel Pu fraction would range, depending on reactor type, between 2.2 and 6.8 percent of the heavy metal (uranium and Pu). Required throughput, depending on reactor type, would range between 52 t/yr (57 tons/yr) and 150 t/yr (165 tons/yr) heavy metal. Therefore, nominal MOX throughput would be 50 t/yr (55 tons/yr) heavy metal, and the bounding MOX throughput would be 150 t/yr (165 tons/yr) heavy metal. Expected annual utility consumption for facility operation, annual chemicals consumed during operation, and the number of personnel required during operation are provided in Appendix C.

Protection of special nuclear material requires an integrated program involving both material control and accountability. Safeguards and security systems would be designed to meet DOE, NRC, and, as applicable, IAEA requirements.

Estimated annual emissions released from the MOX fuel fabrication facility during operations are listed in Appendix F. These emissions would be made up of various gases used or otherwise generated as a result of activities involved in MOX fuel fabrication. All gaseous effluent streams coming from the facility would be thoroughly scrubbed or filtered to remove or reduce the amount of undesirable particulates before release. Estimates of annual wastes resulting from the MOX fuel fabrication facility are shown in Appendix E. No HLW would be generated during normal operations. A diagram of the water balance for the new MOX fuel fabrication facility is presented in Appendix D.

Construction. The construction of the MOX facility would require 6 years and have a peak annual employment of 475 construction workers. The primary constraint on this schedule is the coincident operation of the MOX fuel fabrication facility with that of the two to five dispositioning reactors and the availability of the PuO_2 stock. Additional land area required for construction is projected to be approximately 40 ha (99 acres). This provides

Table 2.4.5.1–1. Mixed Oxide Fuel Reactors Operations Assumptions

Reactor Type (3 to 5 LWRs required)	Average MOX Enrichment of Pu in Heavy Metal (percent)	Pu Throughput (t/yr)	MOX Throughput (t/yr of heavy metal)
Existing			
BWR-full MOX	3.0	3.0	98.8
PWR-full MOX	4.2	5.0	118.2
CANDU-reference MOX[a]	2.2	2.9	136.1
CANDU-CANFLEX MOX[a]	3.4	5.0	149.9
Evolutionary			
Large	6.8	3.5	52.2
Small	6.6	4.1	61.4

[a] CANDU-reference MOX utilizes a standard fuel bundle, whereas the CANFLEX-MOX option uses an alternate fuel design that would permit the use of higher Pu concentrations and result in a higher burn-up of the MOX fuel.

Source: DOE 1996o; LANL 1996b.

for construction material laydown, warehousing, and temporary parking. Materials and resources consumed during construction of a new facility, and the number of construction personnel required, are presented in Appendix C. Total amounts of solid and liquid wastes generated during construction are given in Appendix E.

Waste Management. The solid and liquid nonhazardous wastes generated during construction would include concrete and steel construction waste materials and sanitary wastewater. The steel construction waste would be recycled as scrap metal before construction was completed. The remaining nonhazardous wastes generated during construction would be disposed of by the contractor as part of the construction project. Uncontaminated wastewater would be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Non-hazardous wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes such as adhesives, oils, and solvent rags would be packaged in DOT-approved containers and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. No soil contaminated with hazardous or radioactive constituents is expected to be generated during construction. However, if any were generated, it would be managed in accordance with site practice and all Federal and State standards.

Operation of a new MOX fuel fabrication facility would generate TRU, low-level, hazardous, mixed, and nonhazardous wastes. The conceptual design includes waste management facilities that would treat and package all waste generated into forms that would enable staging and disposal in accordance with RCRA and other applicable statutes. TRU and mixed TRU waste would be treated and packaged to meet the WIPP WAC. These wastes would be stored awaiting shipment to a Federal repository (assumed to be WIPP, depending on decisions resulting from the supplemental EIS for the proposed continued phased development of WIPP for disposal of TRU waste). LLW would be treated and packaged to meet the WAC of an onsite or offsite LLW disposal facility. The LLW treatment/disposal facilities that would be used would be consistent with decisions resulting from the Waste Management PEIS and NEPA reviews tiered from that PEIS. Mixed LLW would be treated and disposed of in accordance with the respective site treatment plan which was developed to comply with the *Federal Facility Compliance Act* of 1992, if applicable, and with decisions made pursuant to the Waste Management PEIS and tiered NEPA reviews, if applicable. Hazardous wastes would be packaged in DOT-approved containers and shipped to RCRA-permitted treatment and disposal facilities. Liquid nonhazardous wastes, such as sanitary, utility, and process wastewater, would be treated and discharged in accordance with the site practice or reclaimed to use as makeup water when economically and/or environmentally desirable. Solid nonhazardous waste would be disposed of in permitted landfills and recycled as appropriate. Additional details can found in Section E.3.2.3.

Transportation. Transportation of Pu and associated wastes would be subject to government regulations and DOE Orders regarding safety and security. The facility would receive PuO_2 and send out completed MOX fuel bundles. Intersite shipment of Pu-bearing material would be by SST to minimize potential for diversion. For domestic MOX fuel fabrication, UO_2 feed stock would come from existing domestic commercial sources and would be shipped by approved commercial carriers. UO_2 feed stock for European MOX fuel fabrication would come from existing European sources. Appendix G presents intersite transportation data for input and output materials.

European Mixed Oxide Fuel Fabrication Facility. MOX fuel could be produced in existing European MOX fuel fabrication facilities. However, studies have shown that the Europeans are driving their MOX fuel fabrication capacity and projected MOX fuel demand towards a balance (DOE 1995c:1-7). In the near-term, European MOX fuel fabricators have excess capacity that could be applied to support weapons-Pu disposition. This excess capacity could support fabrication of lead test assemblies and possibly partial reloads or a few reload full cores. While the Europeans may be willing to expand their capacity to support surplus weapons-Pu disposition, the United States would likely have to pay a premium for such MOX fuel. In addition, because European MOX capacities and demand could unexpectedly change, resulting in the loss or gain of excess capacity, until contracts are signed for the fabrication of fuel from U.S. surplus-weapons Pu, the United States should not rely on excess European MOX fabrication capacity in the long term. Transportation risks associated with moving the Pu feed materials and the finished MOX fuel across the global commons are presented in Appendix G.

2.4.5.2 Existing Light Water Reactor Alternative

Under this alternative, surplus Pu would be removed from storage, processed through the pit disassembly/ conversion facility or the Pu conversion facility, packaged, transported to a MOX fuel fabrication facility, and converted to MOX fuel. The finished MOX fuel would be transported to three to five existing LWRs for use in lieu of conventional uranium reactor fuel. The reactors employed for domestic electric power generation are conventional LWRs that use water as a moderator and coolant. The two types of LWRs used are pressurized water reactors (PWRs) and boiling water reactors (BWRs). Approximately two-thirds of the operating power reactors in the United States are PWRs.

In accordance with the Preferred Alternative for surplus Pu disposition, three to five existing LWRs could be selected. This would occur only after negotiations between DOE and interested parties, and through a competitive procurement process. Further tiered NEPA review will be conducted to examine locations (as many as five sites or as few as one site) should the Preferred Alternative be selected at the ROD.

Facility Description. A sample of reactors from across the United States was compiled in order to generate generic operating characteristics for a commercial LWR, since no specific site or reactor has been selected. The sample was studied to determine valid, applicable characteristics that could be used to describe a generic reactor using MOX fuel. The sample includes eight operating high power (greater than 1,200 megawatt electric [MWe]) PWRs and four BWRs built after 1975. Characteristics of these 12 were felt to be representative of both reactor types, since none of the 12 experienced any unusual operating conditions over the operating period reviewed. Where possible, data was averaged for the 5-year period to smooth out unusually low or high values due to shutdowns for reasons other than normal refueling or maintenance activities.

Data for each reactor characteristic were taken for calendar years 1988 to 1992 (ORNL 1995b:A-5). Entries for all 12 plants were used to determine an average for each listed characteristic.

Nuclear power plants generally contain the four major components described below. Figure 2.4.5.2–1 depicts a typical LWR facility.

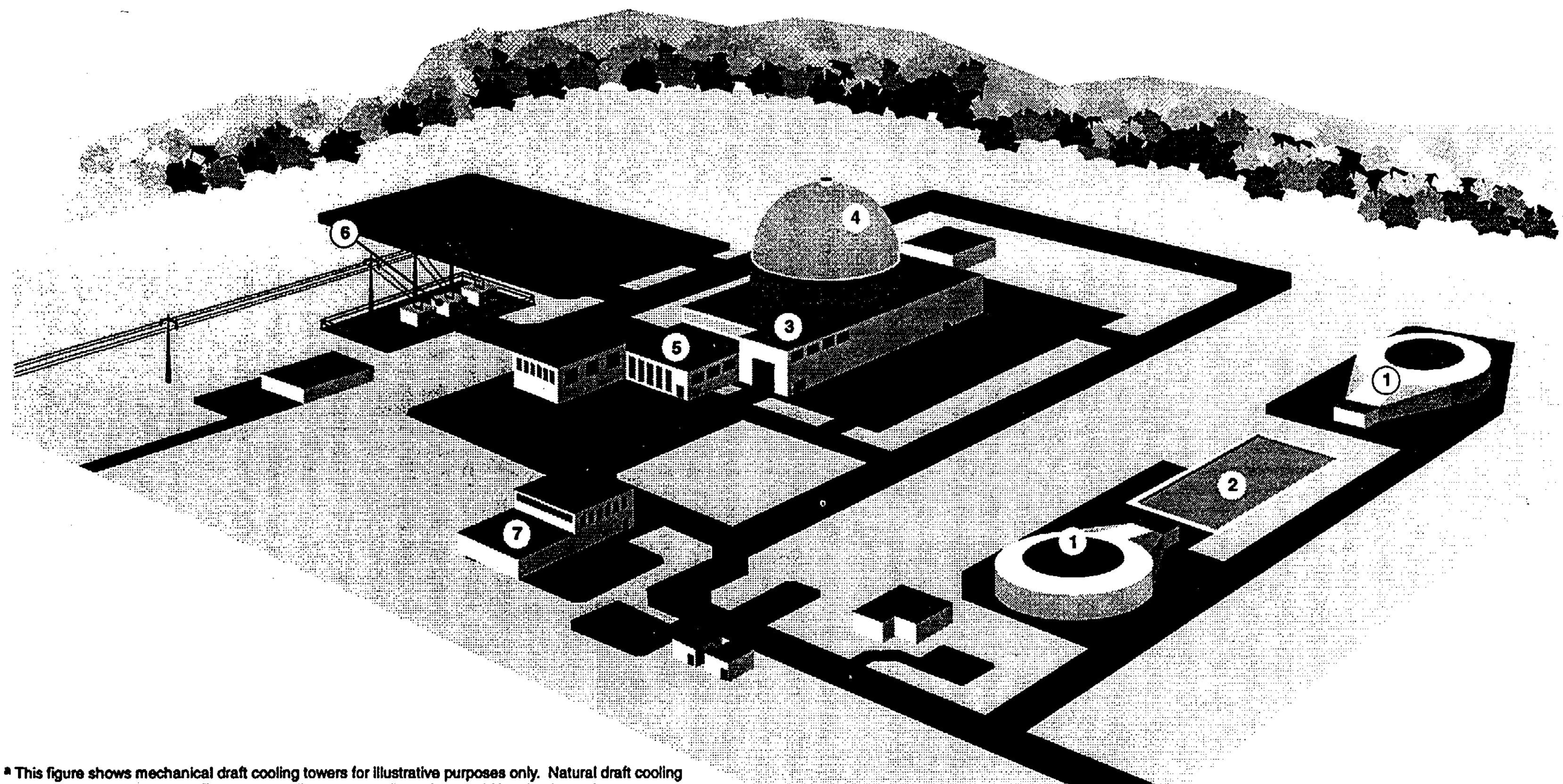
Reactor Building. This building houses the reactor vessel, the suppression pool (BWRs only), steam generators and pressurizers (PWRs only), pumps, and associated piping. BWRs generate steam directly within the reactor core and pass it through internal moisture separators and steam dryers before sending it to the turbine. In contrast, PWR reactor heat is transferred from the primary coolant to a secondary coolant loop that is at a lower pressure. Generated steam from the secondary loop then flows to the turbine.

All domestic nuclear power plants have containment structures as a major safety feature to prevent release of radionuclides in the event of an accident. BWR containments are composed of a suppression pool and dry well. PWRs have one of three types of containments structured: large, dry; subatmospheric; or ice condenser. Large, dry containments comprise approximately 80 percent of the PWR containment structures.

Turbine Building. This building houses the steam turbine and generator, condenser, waste heat rejection system, pumps, and equipment that support these systems.

Auxiliary Buildings. These buildings house support systems such as the ventilation system, emergency core cooling system, water treatment system, waste treatment system, fuel storage facilities, and plant control room. Also, the plant site contains a large switchyard.

1. Cooling Tower (mechanical draft)[a]
2. Cooling Tower Basin
3. Turbine Building
4. Reactor Building
5. Interim Spent Nuclear Fuel Storage Building
6. Switchyard
7. General Service Building



[a] This figure shows mechanical draft cooling towers for illustrative purposes only. Natural draft cooling towers could also be used. The exact cooling tower configuration would be site dependent.

Note: Drawing not to scale.

Source: ORNL 1995b.

2453/S&D

Figure 2.4.5.2–1. Representative Existing Light Water Reactor Facility (Perspective).

Cooling Towers and Ponds. Water is used predominantly for cooling in nuclear power plants, and accordingly these facilities are designed to remove excess heat without dumping this heat directly into adjacent water bodies. The quantity of water used is a function of several factors, including the capacity rating of the plant and the increase in cooling water temperature from intake to discharge. Therefore, the larger the plant, the greater the quantity of waste heat to be dissipated and the greater the quantity of cooling water required. In addition, the quantity of water used is a function of the type of cooling system.

Approximately half of the operating power reactors use "closed-cycle" cooling systems as opposed to "once-through" cooling systems. In closed-cycle systems, waste heat is removed by dissipation to the atmosphere, usually through cooling towers. Several types of closed-cycle cooling systems are currently in use. These systems consist of either natural or mechanical draft cooling towers, cooling ponds, cooling lakes, or cooling canals. Most of the water used for cooling is not returned to a water source because the predominant cooling mechanism associated with closed-cycle systems is evaporation.

In addition to removing waste heat, closed-cycle systems provide cooling for service water and auxiliary cooling water systems. At closed-cycle cooling sites, the additional water needed for source water and auxiliary cooling water systems is usually less than 5 percent per year of that needed for waste heat cooling.

In a once-through cooling system, circulating water is drawn from an adjacent body of water (such as a lake), passed through cooling tubes, and returned to the same body of water at a higher temperature. The volume of water required for service and auxiliary systems is usually less than 15 percent of the volume required for waste heat cooling at once-through cooling sites. Some systems are augmented with helper cooling towers that reduce the temperature of the water released. Waste heat is then dissipated in the receiving water body.

The water intake and discharge structures accommodate the source water body and minimize impacts to the aquatic ecosystem in both cooling systems. The intake structures are generally located along the shoreline of the body of water and equipped with fish protection devices. The discharge structures are generally of the jet or diffuser outfall type and are designed to promote rapid mixing of the effluent stream with the receiving body of water. Chemicals used for corrosion control and other water treatment purposes are also mixed with the cooling water and then discharged from the system.

Some nuclear power plants use groundwater as a source of makeup or potable water in addition to surface water sources. Other existing LWR sites operate dewatering systems that intentionally lower the groundwater table in the vicinity of building foundations either through pumping or a system of drains.

Facility Operations. Three to five existing LWRs would be operated to achieve 3 to 5 t/yr (3.3 to 5.5 tons/yr) throughput for disposition of surplus Pu and simultaneous production of electric power. No attempt was made to characterize the optimum reactor deployment approach. The data presented and analyzed in this PEIS is representative of reactor operations using full MOX fuel cores. The actual core loading for individual reactors will be determined as part of business decisions that follow the ROD. The MOX fuel Pu fraction would range, with reactor type, between 3 and 4.2 percent. MOX throughput depends on reactor type and ranges between 99 t/yr (109 tons/yr) and 118 t/yr (130 tons/yr) heavy metal (uranium and Pu). After discharge from the reactor, the spent MOX fuel assemblies would be stored at the reactor site for up to 10 years before further disposition. A typical LWR facility fuel cycle is depicted in Figure 2.4.5.2–2.

Construction. Major construction activities associated with the existing domestic LWRs that could be selected for this alternative have been completed. The use of MOX fuel in these reactors may require an internal modification to reactor site fuel receiving and storage buildings to properly secure the MOX fuel prior to its use. No significant additional land would be required for this construction.

Waste Management. During the fission process, radioactive products build up within the fuel. Virtually all of these products are contained within the fuel. However, a small fraction of the fission products can escape the fuel and contaminate the reactor coolant. The primary system coolant also contains radioactive contaminants as a result of neutron activation. The radioactivity found in the LWR coolant is the source of gaseous effluent, liquid effluent, and solid radioactive wastes. The following describes the basic design and operation of PWR and BWR radioactive waste treatment systems.

Gaseous Radioactive Effluents. For BWRs, an air ejector is the primary source of routine radioactive gaseous effluents released to the atmosphere. Air ejectors are used to remove noncondensable gases from the coolant to improve power conversion efficiency and reduce gaseous and vapor leakages to the atmosphere. After monitoring and filtering, the leakages are discharged to the atmosphere by the building ventilation system. The offgas treatment systems collect noncondensable gases and vapors exhausted from the condenser by the air ejectors. These offgases are then processed through a series of delay systems and filters to remove airborne radioactive particulates and halogens, thereby minimizing the quantities of radionuclides that might be released to the atmosphere. Building ventilation system exhausts are another source of gaseous radioactive emissions for BWRs.

The PWRs have three primary sources of gaseous radioactive effluents: discharges from the gaseous effluent management system, discharges associated with the exhaust of noncondensable gases from the main condenser (if a primary-to-secondary system leak exists), and radioactive gaseous discharges from the building ventilation exhaust. This includes discharges from the reactor building, the reactor auxiliary building, and the fuel-handling building.

The gaseous effluent management system collects fission products. These fission products consist mainly of inert gases that migrate to the primary coolant. A small portion of the primary coolant flow is continually diverted to the primary coolant purification, volume, and chemical control system to remove contaminants and adjust the coolant chemical makeup and volume. During this process, noncondensable gases are stripped and routed to the gaseous effluent management system, which consists of a series of gas storage tanks. The storage

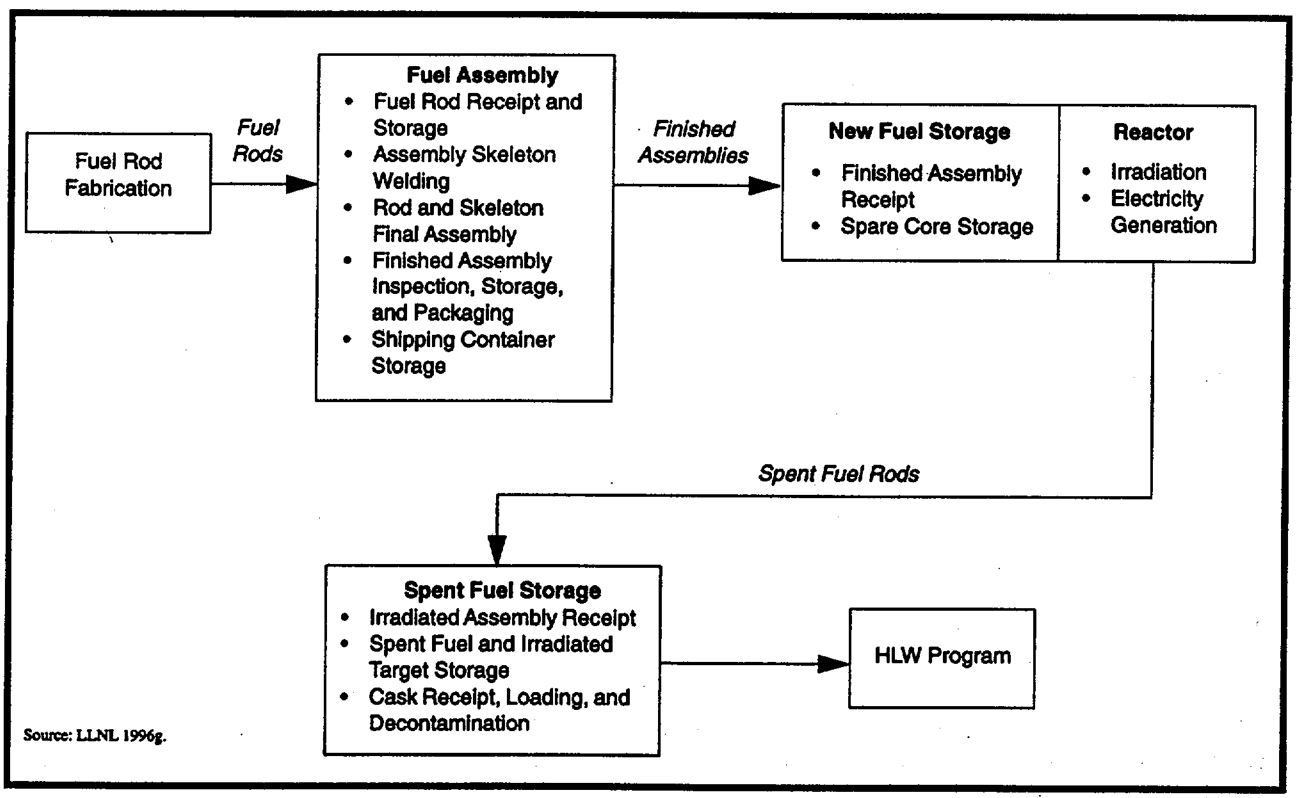


Figure 2.4.5.2–2. Representative Existing Light Water Reactor Fuel Cycle.

tanks allow the short half-life radioactive gases to decay, releasing only relatively small quantities of long half-life radionuclides to the atmosphere. In addition, some PWRs use charcoal delay systems rather than gas holdup tanks. Expected gaseous radioactive effluent is shown in Appendix F.

Liquid Radioactive Effluents. The source of liquid radioactive effluents in LWRs is radionuclide contaminants in the primary coolant. The specific sources, their mode of collection and treatment, and the types and quantities of liquid radioactive effluents released to the environment are similar in BWRs and PWRs. The following discussion applies to both BWRs and PWRs, with distinctions made only when important differences exist.

Liquid effluents from LWRs may be classified in the following categories: clean wastes, dirty wastes, detergent wastes, turbine building floor drain water (BWRs only), and steam generator blowdown (PWRs only). Clean wastes include all liquid effluents with normally low conductivity and variable radioactivity content. These wastes are collected from equipment leaks and drains, valve and pump seal leakoffs not collected in the reactor coolant drain tank, and other leakage sources.

Dirty wastes include all liquid effluents with moderate conductivity and variable radioactivity content that, after processing, may be used as reactor coolant makeup water. Dirty wastes consist of liquid effluents collected in the containment building sump, auxiliary building sumps and drains, laboratory drains, sample station drains, and other miscellaneous floor drains. Detergent wastes consist primarily of laundry wastes and personnel and equipment decontamination wastes. These wastes normally have a low radioactivity content. Water from the turbine building floor drain usually has high-conductivity and low-radionuclide content. In PWRs, steam generator blowdown can contain relatively high concentrations of radionuclides, depending on the amount of primary-to-secondary leakage present. Following treatment, the water may be reused or discharged.

Each of these liquid effluent sources receives varying degrees of and different types of treatment before storage for reuse. Some treated effluents can also be discharged by a site to the environment under the National Pollutant Discharge Elimination System (NPDES) permit. The extent and types of treatment depend on the chemical and radionuclide content of the effluent. To increase the efficiency of processing, effluents of similar characteristics are batched before treatment.

Operating plants have steadily increased the degree of treatment and storage of liquid radioactive effluents. In addition, extensive recycling of steam generator blowdown in PWRs is now common, and secondary side wastewater is routinely treated. Also, the systems used to treat effluents may be augmented with the use of commercial mobile treatment systems. As a result, radionuclide releases in liquid effluent from LWRs have generally declined. Expected liquid radioactive effluent is shown in Appendix E.

Solid Radioactive Waste. Nuclear power plants generate solid LLW through the removal of radionuclides from liquid waste streams, filtration of airborne gaseous emissions, and removal of contaminated material from various reactor areas. Concentrated liquids, filter sludges, waste oils, and other liquid sources are segregated by type and then flushed to storage tanks. They are stabilized for packaging in a solid form by dewatering, then slurried into 208-l (55-gal) steel drums and stored onsite in shielded buildings or other facilities until suitable for offsite disposal. These buildings usually contain volume reduction facilities to reduce LLW for offsite disposal.

High-efficiency particulate air (HEPA) filters are used to remove radioactive material from gaseous plant effluents. These filters are compacted in volume reduction facilities. The material is then disposed of as solid radioactive waste.

Solid LLW consists of contaminated protective clothing, paper, rags, glassware, compactible and noncompactible trash, and non-fuel-irradiated reactor components and equipment. Most of this waste comes from plant modifications and routine maintenance activities. Additional sources include tools and other materials contaminated from use in the reactor environment. Compacted dry radioactive waste is the largest single form of

LLW generated by nuclear plants, and it comprises one-half the total average annual volumes from PWRs and one-third of total average annual volumes from BWRs. Expected waste generated is shown in Appendix E.

Spent Nuclear Fuel. The formation of fission products and actinides when nuclear fuel is irradiated in reactors produces spent fuel. After it is removed from reactors, spent fuel is stored in racks in storage pools to isolate it and to allow the fuel to cool (that is, lose some radioactivity due to decay of the short-lived radioisotopes). Delays in siting a permanent repository, as well as the continual filling of spent fuel pools, have led utilities to seek other storage solutions. These solutions include high-density storage within the existing storage pools, aboveground dry storage, longer fuel burnup, and shipment of spent fuel to other plants.

Efforts are underway to develop dry storage technologies. These technologies include casks, silos, dry wells, and vaults. The NRC has already licensed a number of casks for utilization by public utilities. Dry storage is used by about 5 percent of the operating sites. These facilities are simpler and more readily maintained than fuel pools. They offer a more stable means of storage, occupy relatively little land area (less than 0.2 ha [0.5 acres] in most cases), and offer important economic advantages. Spent fuel is required to be maintained in the spent fuel storage pool for up to 10 years to allow for sufficient cooling. The increased number of MOX spent fuel assemblies shown in Table 2.4.5.2–1 would therefore need to be held in an existing pool for this same amount of time. All the plants studied have sufficient pool capacity to accommodate additional assemblies resulting from use of MOX fuel.

Table 2.4.5.2–1. Existing Light Water Reactor Facility Additional Spent Fuel Generation/Storage Requirements

	Spent Fuel Assemblies	
	PWR	**BWR**
Typical LEU-fueled plant	48	127
Additional for MOX-fueled plant (average)	32	15

Source: ORNL 1995b.

Transportation. There are five types of radioactive material shipments: LLW transported from plants to disposal facilities, LLW shipped to offsite facilities for volume reduction, nuclear fuel shipments from fuel fabrication facilities to plants for loading into reactors (which occurs on a 12- to 18-month cycle), spent fuel shipments from the storage pool at the reactor site to a repository (would only occur after a repository is recommended, approved, and licensed pursuant to the NWPA, and the particular fuel is accepted by the repository), and spent fuel shipments to other nuclear power plants with available storage space (an infrequent occurrence usually limited to plants owned by the same utility).

Waste packaging protects workers and the public from exposure during radioactive material transport. Operation restrictions on transport vehicles, ambient radiation monitoring, imposition of licensing standards (which ensure proper waste certification by testing and analysis of packages), waste solidification, and training of emergency personnel are also used.

A typical PWR creates approximately 44 shipments of LLW per year, while an average BWR makes 104 shipments per year. The majority of the LLW is shipped to disposal facilities by flatbed truck. These shipments are typically packaged in 208-l drums or other Type A containers. These containers must maintain sufficient shielding to limit radiation exposure to handling personnel and do not allow for release of radioactive material under normal transportation conditions.

Fresh MOX fuel is substantially more radioactive than fresh LEU fuel and would be shipped in Type B packages designed and certified for the shipment of unirradiated MOX fuel. One such package is Model No. MO-1 (Certificate No. 9069). Because the quantity of Pu in the fuel is greater than 6 kg (13.2 lbs), the unirradiated

MOX fuel package would be transported within an SST. A variant for this alternative is to use an existing European MOX fuel fabrication facility on a short-term basis. Pu feed material for the European facility would be transported across the global commons to the fabrication site. Similarly, the finished MOX fuel would be transported back to the United States across the global commons. An analysis of the transportation risks associated with this variant are presented in Appendix G.

After discharge from the reactor, spent fuel is placed in the spent fuel storage pool and allowed to cool until it can be sent to permanent disposal. Because of the limited size of spent fuel pools, some utilities have resorted to shipment of spent fuel between different reactors (usually within the same utility). For shipment, spent fuel is placed in Type B packages (called casks), and shipped by either truck or rail. Spent fuel shipping casks are very robust, and are designed to retain the highly radioactive contents under both normal and accident conditions.

A number of truck and rail casks are available for shipment of LEU spent fuel. Shipment of MOX spent fuel may require that each cask design be re-evaluated, and the NRC certificate may need to be amended to address the MOX spent fuel characteristics. Among the many casks designed for spent fuel, truck casks in the 23-t (25-tons) to 36-t (40-tons) range, such as (1) NAC-LWT (for one PWR or two BWR assemblies), (2) GA-4 (for four PWR assemblies), and (3) the GA-9 (for nine BWR assemblies), could be utilized.

2.4.5.3 Partially Completed Light Water Reactor Alternative

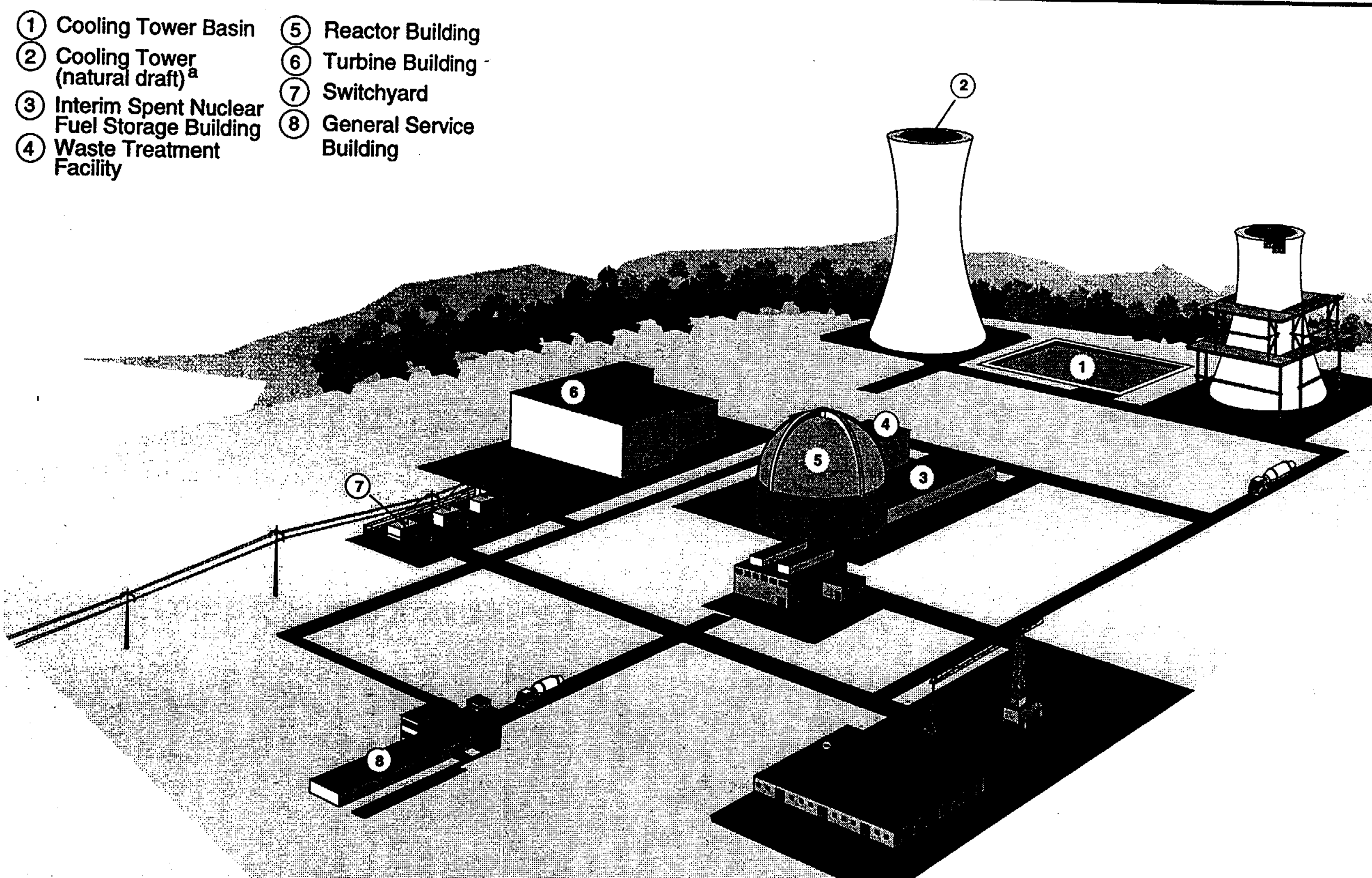
Under this alternative, commercial domestic LWRs on which construction has been halted would be completed and operated for disposition. The completed reactors would use MOX fuel in lieu of conventional LEU fuel. The characteristics of these units would essentially be the same as those of contemporary operating commercial LWRs discussed in Section 2.4.5.2. There are seven partially completed commercial LWRs located at four sites in the continental United States. The Bellefonte Nuclear Plant has been selected for study as a representative site for this alternative. As was stated for the Existing LWR Alternative, before the surplus Pu can be used as reactor fuel, a conversion process would be required to transform the Pu, in its various forms, into a usable form. Pit disassembly/conversion, Pu conversion, and MOX fuel fabrication facilities would be required to process the Pu into MOX fuel. All requirements shown in this section are in addition to those previously described for the pit disassembly/conversion, Pu conversion, and MOX fuel fabrication facilities. Since the reactors that would use the MOX fuel are in addition to existing commercial reactors, these partially completed reactors would create an additional amount of spent fuel to be added to the existing disposal requirements for uranium-based fuels.

In accordance with the Preferred Alternative for surplus Pu disposition, two partially completed LWRs could be selected. This would occur only after negotiations between DOE and interested parties, and through a competitive procurement process. Further tiered NEPA review will be conducted to examine locations should this option of the Preferred Alternative be selected at the ROD.

Facility Description. The partially completed LWRs contain the same four major components described in Section 2.4.5.2: the reactor building, the turbine building, auxiliary buildings, and cooling towers or ponds. A representative partially completed reactor site layout is depicted in Figure 2.4.5.3–1.

Facility Operations. Partially completed reactor facility operations would be generally the same as those described in Section 2.4.5.2. In this alternative, two partially completed reactors would be operated with an average MOX throughput of 68 t/yr (75 tons/yr) heavy metal.

Construction. Construction of two partially completed reactors would have to be completed to satisfy requirements under this alternative. Appendix C contains resources and personnel requirements necessary to complete construction of the typical pair of reactors. The construction of the partially completed LWR facility would require 7 years and have a peak annual employment of approximately 2,300 construction workers.



[a] This figure shows natural draft cooling towers for illustrative purposes only. Mechanical draft cooling towers could also be used. The exact cooling tower configuration would be site dependent.

Note: Drawing not to scale.

Source: Modified from LLNL 1996g.

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Figure 2.4.5.3–1. Representative Partially Completed Light Water Reactor Facility (Perspective).

Waste Management. The solid and liquid nonhazardous wastes generated during construction would include concrete and steel construction waste materials and sanitary wastewater. The remaining nonhazardous wastes generated during construction would be disposed of as part of the construction project by the contractor. Uncontaminated wastewater could be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes generated during construction would consist of materials such as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. No radioactive waste would be generated during construction. Waste management requirements for operation are the same as those discussed in Section 2.4.5.2. Appendix F shows reactor average annual emissions during the peak construction year, respectively.

Transportation. Transportation requirements for the partially completed LWRs are the same as those discussed in Section 2.4.5.2.

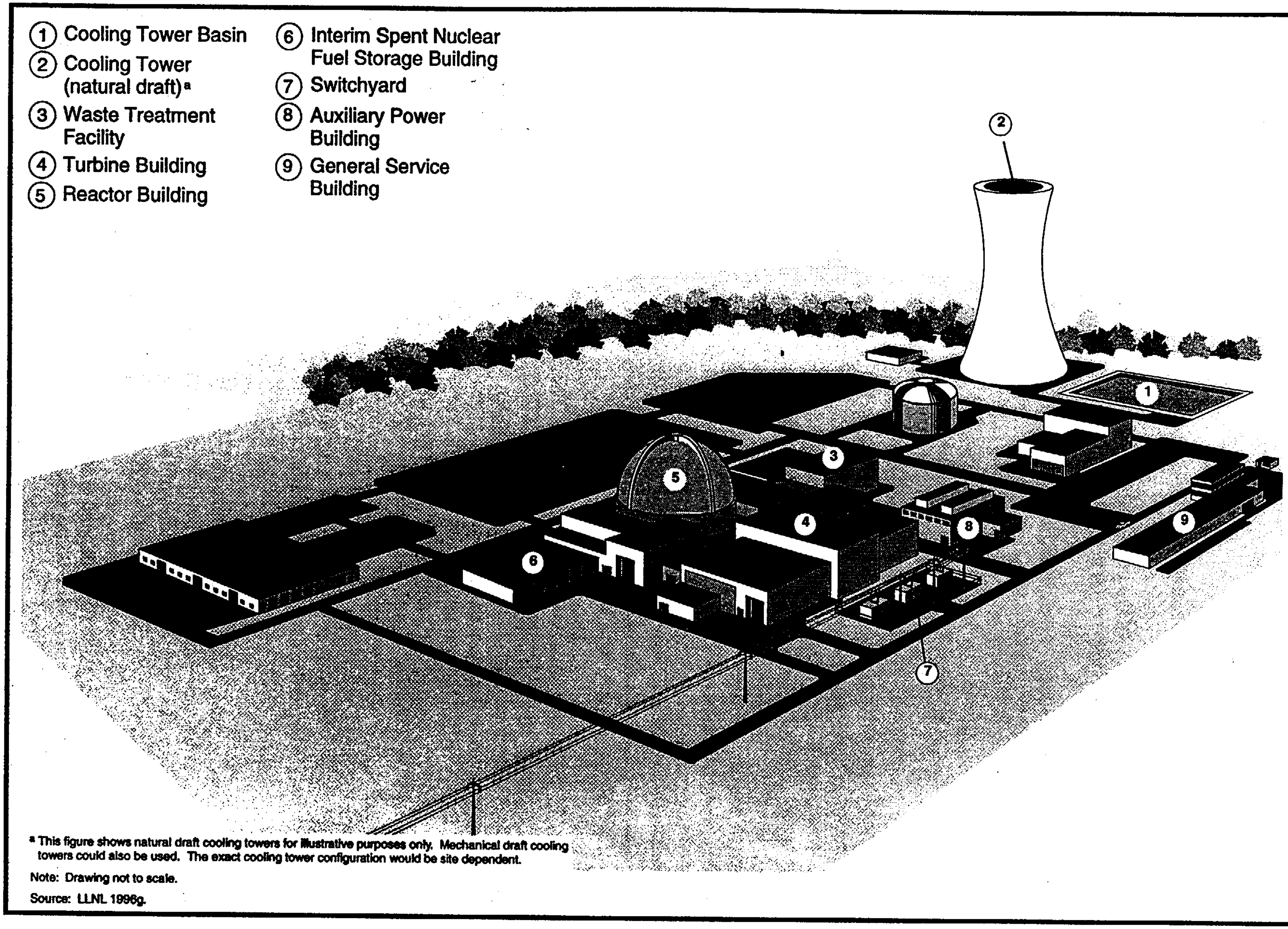
2.4.5.4 Evolutionary Light Water Reactor Alternative

Evolutionary LWRs would be designed for the purposes of surplus Pu disposition and simultaneous production of electric power. As for the Existing LWR and Partially Completed LWR Alternatives, before the surplus Pu can be used as reactor fuel, a conversion process is required to transform the Pu, in its various forms, into a usable form. Pit disassembly/conversion, Pu conversion, and MOX fuel fabrication facilities would be required to convert the Pu into MOX fuel. Each fuel assembly loaded into a reactor would reside in the reactor between 4 and 5.4 years, during which time the reactor would be at power 75 percent of the time. After discharge from the reactor, the spent fuel assemblies would be stored at the reactor site for up to 10 years before further disposition. All requirements in this section are in addition to those previously described for the pit disassembly/ conversion, Pu conversion, and MOX fuel fabrication facilities. Since the MOX-burning evolutionary reactors would be in addition to existing commercial reactors, these evolutionary reactors would create an additional amount of spent fuel to be added to the existing disposal requirement for uranium-based fuels.

Facility Description. Two evolutionary LWR design approaches, based on rated power (large and small reactor, designated large evolutionary LWR and small evolutionary LWR in the following discussion), are under consideration. There are three large evolutionary LWR designs: an approximately 1,400-MWe PWR, an approximately 1,250-MWe PWR, and an approximately 1,300-MWe BWR. A small, evolutionary LWR, approximately 600-MWe PWR, is also under consideration. For any design, an evolutionary LWR facility would consist of the following major components: the reactor, interim spent fuel storage, power conversion facility, and waste treatment facility. The planned Pu disposition campaign would require a minimum of two large evolutionary LWRs or four small evolutionary LWRs. The total disturbed land area for the evolutionary LWR operating facility would be approximately 138 ha (340 acres). In addition, a 1.6-km (1-mi) wide buffer zone around the facility may be required, depending on NRC licensing requirements. Figure 2.4.5.4–1 depicts a typical evolutionary LWR facility site plan. The major components of an evolutionary LWR facility are described below.

Reactor. The individual reactors would be an improved version of existing commercial electric power generating reactors using ordinary (light) water as both the moderator and coolant. The core, contained within a steel pressure vessel, would be composed of bundles of fuel rods. The fuel rods would consist of MOX fuel. The evolutionary LWR facility fuel cycle is depicted in Figure 2.4.5.4–2.

The cooling system selected, wet or dry, would depend on site characteristics. Both wet and dry cooling systems would use water as the heat exchange medium. Wet systems would use water towers and the evaporation process to carry off heat. Dry systems, designed for cold or high-humidity climates, would use water in closed nonevaporative cooling towers to remove heat by conduction to the atmosphere through heat exchangers. In moderate climates, fans would be added to the dry cooling towers to move air over the vanes of the heat



[a] This figure shows natural draft cooling towers for illustrative purposes only. Mechanical draft cooling towers could also be used. The exact cooling tower configuration would be site dependent.

Note: Drawing not to scale.

Source: LLNL 1996g.

Figure 2.4.5.4–1. Representative Evolutionary Light Water Reactor Facility (Perspective).

exchangers. There would be some water loss through evaporation in a dry system, but significantly less than with a wet tower. Dry cooling towers would be used for the reactors at all dry sites. The use of wet cooling towers would be an option only for the power conversion facility and only when the facility would be located at a wet site.

Interim Spent Fuel Storage Facility. Spent fuel would be stored onsite in an underwater spent fuel storage pool.

Power Conversion Facility. This facility would contain a turbine generator, electrical equipment, control equipment, auxiliary systems, plant support systems, and other equipment.

Waste Treatment Facility. This facility would receive all solid, liquid, and gaseous radioactive waste for storage, treatment, and packaging for either release or disposal at an appropriate permanent waste disposal facility.

Facility Operations. As a minimum, two large reactors or four small reactors would be operated to achieve 3.5 t to 4.1 t/yr (3.6 to 4.5 tons/yr) throughput for the disposition of surplus Pu and the simultaneous production of electric power.

Construction. The construction of the evolutionary LWR would require 6 years and have a peak annual employment of 3,500 construction workers. Additional land area required for construction is projected to be approximately 146 ha (360 acres). This provides for construction material laydown, warehousing, and temporary parking. Appendix C contains resources and personnel requirements required for the construction phase.

Waste Management. The solid and liquid nonhazardous wastes generated during construction would include concrete and steel construction waste materials and sanitary wastewater. The remaining nonhazardous wastes generated during construction could be disposed of as part of the construction project by the contractor.

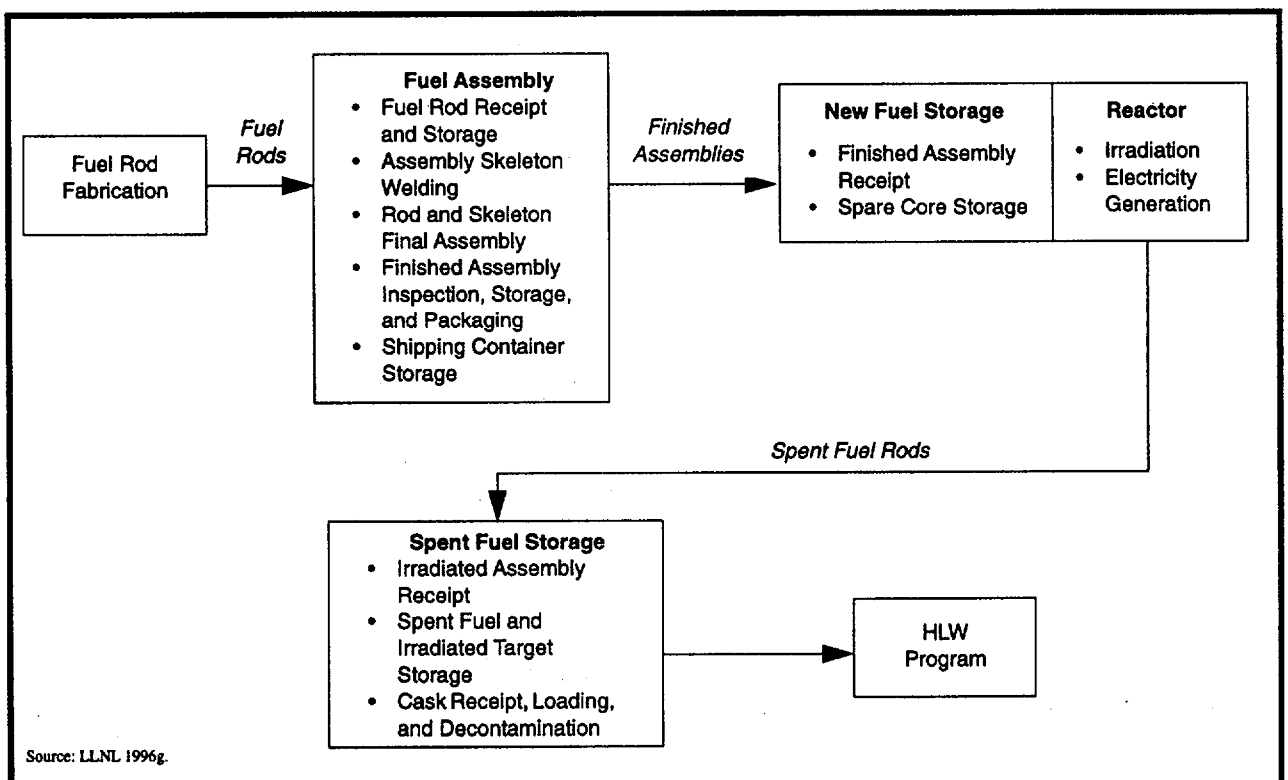


Figure 2.4.5.4–2. Representative Evolutionary Light Water Reactor Fuel Cycle.

Uncontaminated wastewater would be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes generated during construction would consist of materials such as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. No radioactive waste would be generated during construction.

The evolutionary reactor design considers and incorporates waste minimization and pollution prevention. Segregation of activities that generate radioactive and hazardous wastes would be employed, where possible, to avoid the generation of mixed wastes. Where applicable, treatment to separate radioactive and nonradioactive components would be performed to reduce the volume of mixed wastes and provide for cost-effective disposal or recycling. To facilitate waste minimization where possible, nonhazardous materials would be substituted for those materials that contribute to the generation of hazardous or mixed waste. Production processes would be configured with high priority given to minimization of waste production. Where possible, material from the waste streams would be treated to facilitate disposal as nonhazardous wastes. [Text deleted.]

Solid and liquid waste streams would be routed to the waste management system. Solid waste would be characterized and segregated into low-level, mixed, and hazardous wastes, then treated to forms suitable for disposal or storage within the facility. Liquid waste would be treated onsite to reduce hazardous/toxic and radioactive elements before discharge or transport. All fire sprinkler water discharged in process areas would be contained and treated as process wastewater.

Spent Nuclear Fuel. Fuel elements containing spent fuel would be stored for up to 3 years in water-cooled storage basins and up to 7 additional years in dry storage. The spent fuel pool would be equipped with an underwater canister loading system. Twelve spent fuel assemblies would be placed in fixed positions in a borated aluminum or stainless-steel basket for criticality safety. The basket would be contained in a canister whose lids are seal-welded in place. After the 3-year cooling period, the canisters would be drained, vacuum dried, and backfilled with helium through lid penetrations in preparation for dry storage. The canisters would be transferred in a cask to the interim spent fuel storage facility. At the storage facility, the canisters would be transferred into the final storage cask, which would be made of precast concrete and would hold one canister each. Casks would be placed on a concrete basemat. Periodic visual inspections of the canisters and the cask vents would be required. Periodic testing for helium leaks might also be required. Although the spent nuclear fuel is assumed to be stored at the reactor site for 3 to 10 years before further disposition, the facility design would have sufficient capacity to store the spent nuclear fuel for the life of the facility.

Transuranic Waste. The evolutionary LWRs would not generate any TRU waste.

Low-Level Waste. LLW would be generated by the operation of the reactor and support facilities. Process effluents would be temporarily stored in storage tanks before conversion into solid LLW that is suitable for disposal. The liquid effluent, after treatment, would be discharged through a permitted NPDES outfall. The bulk of the solid LLW would be generated in the reactor. Solid LLW would consist of contaminated equipment pieces, plastic sheeting, and protective clothing. This solid LLW would be compacted if appropriate and then disposed in a permitted onsite/offsite disposal facility.

Mixed Low-Level Waste. No liquid mixed LLW would be generated from operating the evolutionary LWR. Solid mixed LLW may originate from wipes laden with contaminated oils and hydraulic fluids. Mixed LLW would be stored in an onsite RCRA-permitted storage facility until treatment.

Hazardous Waste. Liquid hazardous waste would be generated from cleaning solvents, cutting oils, vacuum pump oils, film processing fluids, hydraulic fluids from mechanical equipment, antifreeze solutions, and paint. The cleaning solvent selected would be from a list of non-halogenated solvents. Liquid hazardous waste would be collected in DOT-approved containers and sent to an onsite hazardous waste accumulation area. The hazardous waste accumulation area would provide a 90-day staging capacity prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility. Solid hazardous waste would be generated from nonradioactive materials such as wipes contaminated with oils, lubricants, and cleaning solvents that are used for equipment outside the main processing units. After compaction, if appropriate, the solid hazardous waste would be packaged in DOT-approved containers and sent to a hazardous waste accumulation area for staging before shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility.

Nonhazardous (Sanitary) Waste. Sewage wastewater would be treated in the sanitary wastewater treatment plant. Sewage wastewater would be kept separate from all industrial and process wastewaters and normally would contain no radioactive wastes from the reactor. The sewage wastewater would be routinely monitored for radioactive contaminants. The sludge would be disposed of in a permitted landfill. The treated effluent would be discharged through a permitted NPDES outfall (wet site) or recycled for cooling water makeup and other services (dry site). The treated effluent from the process wastewater treatment would be discharged to the river through an NPDES outfall. Other nonrecyclable, nonhazardous, solid sanitary, and industrial wastes would be compacted and disposed of in a permitted landfill.

Nonhazardous (Other) Waste. The evolutionary reactor design includes stormwater retention facilities with the necessary NPDES monitoring equipment. Rainfall within the LA and PA would be collected separately and routed to the stormwater collection ponds and then sampled and analyzed before discharge. If the runoff were contaminated, it would be treated in the radioactive waste treatment system. Runoff from the PPA may be discharged directly through an NPDES outfall into the natural drainage channels. Cooling tower blowdown would be treated and discharged to the outfall (wet site) or recycled for reuse (dry site). The treated effluent from the utility wastewater treatment would be discharged to the river through an NPDES outfall (wet site) or a natural drainage channel (dry site). All sludges would be disposed of in a permitted landfill.

Transportation. Transportation requirements for the evolutionary LWRs are the same as those discussed in Section 2.4.5.2.

2.4.5.5 Canadian Deuterium Uranium Reactor Alternative

Ontario Hydro operates 20 CANDU reactor units capable of using MOX fuel at five nuclear generating stations in the Province of Ontario. In addition, there is one CANDU reactor in the Province of Quebec and another CANDU reactor in New Brunswick. Under this alternative, surplus Pu would be removed from storage, processed through the pit disassembly/conversion or Pu conversion facility, packaged, transported to the MOX fuel fabrication facility, and converted into MOX fuel. The MOX fuel would be transported to and used in one or more CANDU reactors. The use of Canadian reactors would be subject to the approval, policies, and regulations of the Canadian Federal and Provincial governments.

Ontario Hydro Nuclear Bruce-A Generating Station has been identified as a reference facility by the Government of Canada and is used as a representative site for evaluation of the CANDU Reactor Alternative and the CANFLEX fuel bundle. The Ontario Hydro Nuclear Bruce-A Generating Station, containing four 769-MWe generating stations along with its four-unit sister station, Bruce-B, is located on Lake Huron about 300 km (186 mi) northeast of Detroit, Michigan.

Facility Description. The major components of a CANDU reactor are described below.

Reactor. An individual CANDU reactor has a horizontal, cylindrical, heavy-water filled, calandria tank containing 480 high-pressure fuel channel assemblies (also referred to as tubes) and reactivity control units. Heavy water, deuterium oxide (deuterium is a form of hydrogen with a neutron in its nucleus in addition to the proton of the hydrogen nucleus), is the neutron moderator and reflector. This entire assembly is contained in a light water-filled shield tank to form an integral structure that provides operational and shutdown shielding.

Power Conversion Facility. The turbine hall contains turbo-generators, electrical equipment, control equipment, auxiliary systems, plant support systems, and other equipment.

Vacuum Building. This facility is the focal point of the Negative Pressure Containment System.

Auxiliary Services Building. This facility houses supporting services for the Nuclear Generating Station.

Waste Treatment Facility. This facility would receive all spent fuel, solid, liquid, and gaseous radioactive waste for storage, treatment, and packaging for either release or disposal at an appropriate permanent waste disposal facility.

Facility Operations. The CANDU reactor MOX fuel cycle for CANDU fuel bundles in two CANDU reactors at the representative generating station would dispose of approximately 2.9 t/yr (3 tons/yr) of Pu based on a MOX throughput of 136 t/yr (150 tons/yr) heavy metal. Using the CANFLEX fuel design, four reactors would dispose of 5 t/yr Pu (5.5 tons/yr) based on a MOX throughput of 150 t/yr (165 tons/yr) heavy metal. The fuel cycle is depicted in Figure 2.4.5.5–1.

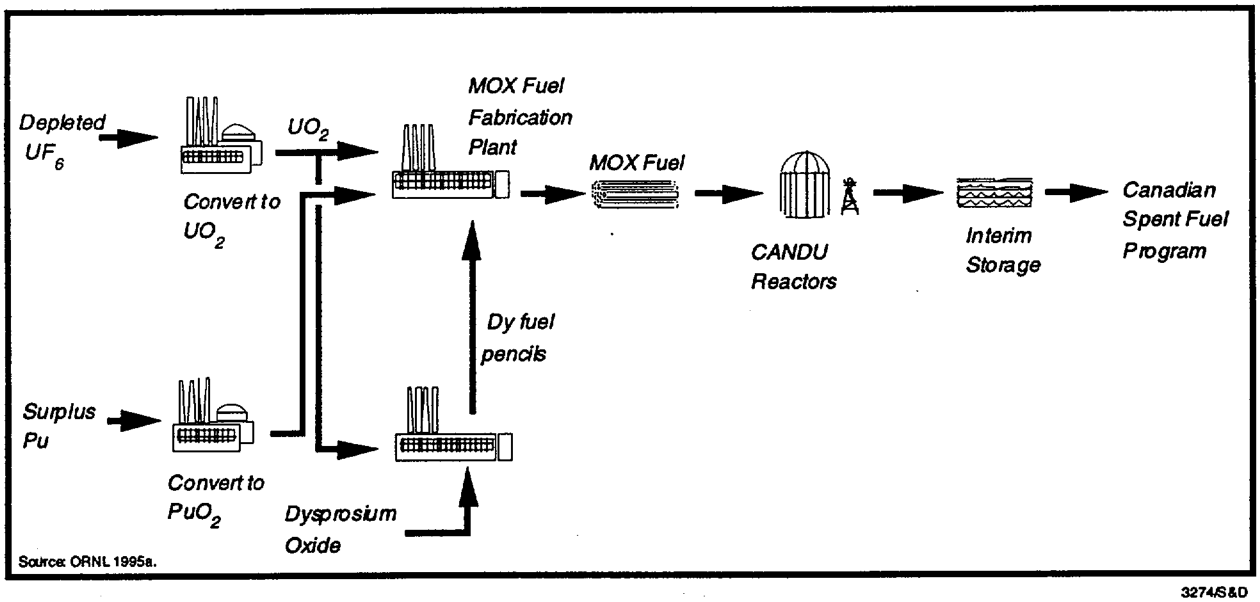


Figure 2.4.5.5–1. Canadian Deuterium Uranium Reactor Mixed Oxide Fuel Cycle.

Construction. The use of MOX fuel in the existing CANDU reactors may require a small addition to reactor site fuel receiving and storage buildings to properly secure the MOX fuel prior to its use. No significant additional land would be required for this construction.

Waste Management. Externally, MOX fuel and natural uranium fuel bundles are identical. The only difference, beside their fuel content, is the higher external radiation level of the MOX fuel bundle. The difference would not result in any increase in the quantity or hazard level of waste produced, processes employed, or facilities required for interim waste storage or disposal.

The Bruce Nuclear Generating Station has facilities for the storage of low-, medium-, and high-level radioactive MOX wastes. Spent MOX fuel bundles would be stored in CANDU wet storage spent fuel modules, equivalent to LWR spent fuel storage racks. Spent MOX fuel decay heat generation and fission product concentration would be similar to current CANDU fuel. The spent fuel resulting from using MOX fuel in the CANDU reactors would be the responsibility of Ontario Hydro and will be stored and disposed of in accordance with procedures established by the Canadian Atomic Energy Control Board.

Transportation. DOE would coordinate the transport of MOX fuel with the Canadian Federal and Provincial Governments. Transportation would be by commercial truck with appropriate security protection, or by SST, in accordance with applicable Federal regulation (49 CFR) and trucking industry practice to ensure safe, secure transport. Fresh MOX fuel bundles would be packaged in a standard stainless steel 208-l (55-gal) container. The packaging would be capable of holding seven CANDU MOX fuel bundles and would have to be certified as Type B packaging and approved for use within both Canada and the United States. The packaging would have to undergo certification by DOE, NRC, and DOT, as well as the Canadian Atomic Energy Control Board and Canadian Ministry of Transport. Although a packaging system has been approved in the United States for shipments of Category 1 materials, it has not yet been approved for the transport of CANDU MOX fuel bundles to Canada.

Based on the annual fuel requirement of 9,052 bundles (ORNL 1995a:26), approximately 54 truckloads per year would be required (slightly more than 1 per week). A brief technical description of MOX fuel use in a CANDU reactor is included in Appendix I.

2.5 COMPARISON OF ALTERNATIVES

The environmental impacts of the storage and disposition alternatives, including the Preferred Alternative, are compared in this section. The emphasis is on those environmental resources and issues that discriminate between the alternatives and are of interest to the public. At the end of this section, Table 2.5–1 provides a summary of environmental impacts for the Preferred Alternative for storage; Table 2.5–2 provides a comparison of environmental impacts for the No Action and long-term storage alternatives; and Table 2.5–3 provides a comparison of environmental impacts for disposition alternatives (including the Preferred Alternative).

2.5.1 LONG-TERM STORAGE ALTERNATIVES

Tables 2.5.1–1 through 2.5.1–6 present a comparison of the key environmental impacts for the long-term storage alternatives and the Preferred Alternative for storage. As discussed in Section 1.6, the Preferred Alternative for storage is a combination of No Action and Upgrade Alternatives for the various DOE sites, and phaseout of Pu storage at RFETS.

For all of the storage sites, the No Action Alternative is used as a baseline from which incremental impacts of the storage alternatives are compared. The phaseout associated with these storage alternatives could reduce human health and waste generation impacts and increase the number of lost jobs at some sites.

Site Infrastructure. For the Upgrade Alternative, all requirements would be within existing site capacities for all sites except for coal at ORR and SRS. Under the Preferred Alternative, coal consumption at ORR and SRS would exceed site storage capacities by less than 1 percent; all other requirements would be within existing site capacities. In those cases where site capacity for fuel storage does not adequately support increased requirements, more frequent deliveries would be scheduled. Increases in resource requirements would be within the following ranges over No Action: electrical energy, 0 to 104 percent (maximum for Pantex); peak electric load, 0 to 90 percent (maximum for Pantex); oil, 0 to 13 percent (maximum for INEL for the Upgrade Alternative); natural gas, 0 to 71 percent (maximum for Pantex); and coal, 0 to 1 percent (maximum for ORR).

For the Consolidation Alterative, all requirements would be within existing site capacities at all sites except for the following: electrical energy (12 percent over existing capacity), oil (1 percent over existing capacity), and natural gas (no existing capacity) at NTS; coal at INEL (97 percent over existing capacity); and oil (1 percent over existing capacity) and coal (2 percent over existing capacity) at SRS. In these cases where site capacity for fuel storage does not adequately support increased requirements, more frequent deliveries would be scheduled. Increases in resource requirements would be within the following ranges over No Action: electrical energy, 8 to 104 percent (maximum for Pantex); peak electric load, 9 to 90 percent (maximum for Pantex); oil, 1 to 5 percent (maximum for Pantex); natural gas, 0 percent (no existing capacity at NTS); and coal, 0 to 97 percent (maximum for INEL). All infrastructure requirements could be met by increasing procurement or, in the case of NTS, by using a different energy source.

For the Collocation Alternative, all requirements would be within existing site capacities at all sites except for the following: electrical energy (21 percent over existing capacity), oil (1 percent over existing capacity), and natural gas (no existing capacity) at NTS; coal at INEL (124 percent over existing capacity); oil (3 percent over existing capacity), and coal (35 percent over existing capacity) at ORR; and oil (1 percent over existing capacity) and coal (3 percent over existing capacity) at SRS. In these cases where site capacity for fuel storage does not adequately support increased requirements, more frequent deliveries would be scheduled. Increases in resource requirements would be within the following ranges over No Action: electrical energy, 8 to 126 percent (maximum for Pantex); peak electric load, 9 to 100 percent (maximum for Pantex); oil, 1 to 14 percent (maximum for ORR); natural gas, 0 percent (no existing capacity at NTS); and coal, 0 to 124 percent (maximum for INEL).

Soil, Cultural, and Paleontological. Ground disturbance during construction activities would potentially affect soil; cultural resources (including historic, prehistoric, and Native American); and paleontological resources. The Upgrade Alternatives and the Preferred Alternative would have fewer impacts because they use existing facilities or involve only small areas of ground disturbance. The Consolidation and Collocation Alternatives would have more impacts because they involve more ground disturbance due to the construction of new facilities.

Land Use and Visual Resources. For land use, the larger facilities associated with Consolidation and Collocation Alternatives would use more land (56 to 87 ha [138 to 215 acres]) than the facilities associated with Upgrade and Preferred Alternatives (0 to 0.1 ha [0 to 0.25 acres]). The Collocation Alternative at ORR would change the current Visual Resource Management (VRM) Class 4 designation of the Bear Creek Road/Route 95 intersection to Class 5. Visual resources at the other DOE sites would not be affected by the storage alternatives because the facilities would be located near other similar structures.

Air Quality and Noise. Since the Collocation and Consolidation Alternatives would result in more air emission sources (exhaust from delivery trucks, generators, and boilers), slightly greater air quality impacts would occur than with the Upgrade and Preferred Alternatives. The more extensive ground disturbance during construction associated with the Consolidation and Collocation Alternatives would also result in higher levels) of particulate matter less than or equal to 10 microns (PM_{10}) and Total Suspended Particulates (TSP) than for the Upgrade and Preferred Alternatives. Potential air emissions for all of the alternatives would be within applicable Federal, State, and local air quality standards and guidelines. Minimal noise impacts are expected from the storage alternatives because of the remote location of the facilities that would be modified or constructed.

Socioeconomics. Beneficial impacts to regional employment would be expected from all storage alternatives at all storage sites (Table 2.5.1–1) except for the site (or sites depending on the alternative) where storage would be phased out. Collocation would generate the largest employment, followed by the Consolidation, Upgrade, and Preferred Alternatives. However, the phaseout at RFETS associated with the Preferred Alternative would result in the loss of approximately 2,200 direct jobs. Due to the small number of the new jobs created by the alternatives relative to the size of the regional economies at all of the DOE sites, community services would not be affected by the long-term storage alternatives. Short-term local transportation impacts may result at all sites from the construction of the facilities associated with the storage alternatives. The larger construction projects (Collocation and Consolidation Alternatives) would have a greater potential to cause short-term congestion on local roads than the smaller construction projects (the Upgrade and Preferred Alternatives).

Water Resources. The water resource impacts for the Consolidation and Collocation Alternatives are greater than for the Upgrade and Preferred Alternatives, both in water requirements and wastewater discharges. Wastewater discharge is dependent on the number of employees, which is greatest for the Consolidation and Collocation Alternatives due to the larger facilities. As shown in Table 2.5.1–2, water resource requirements are the greatest for the Collocation Alternative at all DOE sites because collocation includes the maximum amount of Pu and HEU in the PEIS. Water resource requirements for all the alternatives would impact groundwater availability at Pantex because the additional groundwater withdrawal would contribute to the existing overall decline in water levels of the Ogallala Aquifer. However, there should be minimal impacts to regional groundwater levels from this additional withdrawal. At all other sites, water requirements would have minimal impact on water resources because of the abundance of surface water or groundwater.

Biological Resources. The Preferred Alternative would have no incremental biological resource impacts at INEL and Hanford, and minimal impacts at Pantex and potentially at SRS because of ground disturbance for upgrades. The Consolidation and Collocation Alternatives would have the potential to impact biological resources at all DOE sites because they would involve ground disturbance. At Pantex, previously disturbed land would be used for consolidation and collocation facilities. Threatened and endangered species at NTS and SRS may be affected by the storage alternatives at these sites.

Table 2.5.1–1. Maximum Incremental Direct Employment Over No Action Generated During Operation at Each Candidate Site

Site	Total Site Employment in 2005	Upgrade	Consolidation	Collocation	Preferred Alternative
Hanford	14,586	252[a]	443	572	0
NTS	3,800	NA	527[b]	641[b]	0
INEL	6,911	116[a]	432	561	0
Pantex	3,559	90[c]	509[d]	601	90[e]
ORR	18,010	111	[f]	566[g]	111
SRS	16,562	30[h]	485	614	30[h,i]

[a] Upgrade with RFETS and LANL materials.
[b] Modify P-Tunnel.
[c] Upgrade with RFETS and LANL materials. Actual number of employees during operation could be higher.
[d] Construct new and modify existing storage facilities.
[e] Upgrade with pits from RFETS.
[f] Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.
[g] Construct new Pu and HEU facilities.
[h] Workers would be supplied from existing site workforce.
[i] Upgrade with non-pit materials from RFETS.
Note: NA=not applicable.

Table 2.5.1–2. Maximum Annual Net Incremental Water Usage Over No Action During Operation at Each Candidate Site

Site	No Action in 2005 (million l/yr)	Upgrade (million l/yr)	Consolidation (million l/yr)	Collocation (million l/yr)	Preferred Alternative (million l/yr)
Hanford	195	8.9[a]	110	150	0
NTS	2,400	NA	130[b]	190[b]	0
INEL	7,570	22[a]	66	87	0
Pantex	249	110[a]	110[c]	130	27.5[d]
ORR	14,760	0.24	[e]	360[f]	0.24
SRS	13,247	7.1[a]	360	460	5.7[g]

[a] Upgrade with RFETS and LANL materials.
[b] Modify P-Tunnel.
[c] Construct new and modify existing storage facility.
[d] Upgrade with pits from RFETS.
[e] Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.
[f] Construct new Pu and HEU facilities.
[g] Upgrade with non-pit materials from RFETS.
Note: MLY=million liters per year; NA=not applicable.

Environmental Justice. All six DOE storage sites have, within an 80-km (50-mi) radius, census tracts with greater than 25 percent minority or low-income populations. However, the public health and safety analyses show that air emissions and hazardous chemical and radiological releases from normal operations for all storage alternatives would be within regulatory limits and that no latent cancer fatalities would result. The public health and safety analyses also indicate that radiological releases from accidents would not result in adverse human health or environmental impacts. Potential transportation accidents would be random events along transportation corridors. Therefore, none of the storage alternatives would have disproportionately high or adverse impacts on minority or low-income populations.

Waste Management. All of the storage alternatives would impact existing waste management practices at the DOE sites by increasing the amount of waste that must be treated, stored, and disposed. Depending on decisions in the waste-type-specific RODs for the Waste Management PEIS, wastes would be treated and disposed of onsite or at regionalized or centralized DOE sites. Generally, the Consolidation and Collocation Alternatives would generate more wastes than the Upgrade and Preferred Alternatives. Tables 2.5.1–3 through 2.5.1–5 show the maximum incremental waste generation rates for solid low-level, solid TRU, and solid hazardous wastes at the six candidate sites.

Table 2.5.1–3. Maximum Annual Net Incremental Volume of Solid Low-Level Waste Over No Action Generated During Operation at Each Candidate Site

Site	Waste Generated in 2005 (m^3)	Upgrade (m^3)	Consolidation (m^3)	Collocation (m^3)	Preferred Alternative (m^3)
Hanford	3,390	89[a]	1,260	1,300	0
NTS	15,000	NA	1,260	1,300	0
INEL	7,200	500[a]	1,260	1,300	0
Pantex	32	1,260[a]	1,260	1,300	138[b]
ORR	7,320	3	[c]	1,300[d]	3
SRS	16,400	0	1,220[e]	1,260[e]	0

[a] Upgrade with RFETS and LANL materials.
[b] Upgrade with pits from RFETS.
[c] Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.
[d] Construct new Pu and HEU facilities.
[e] Net waste from new facility and from phaseout of existing facility.
Note: NA=not applicable.

Table 2.5.1–4. Maximum Annual Net Incremental Volume of Solid Transuranic Waste Over No Action Generated During Operation at Each Candidate Site

Site	Waste Generated in 2005 (m^3)	Upgrade (m^3)	Consolidation (m^3)	Collocation (m^3)	Preferred Alternative (m^3)
Hanford	271	21[a]	10	10	0
NTS	0	NA	10	10	0
INEL	3.5	2[a]	10	10	0
Pantex	0	10[a]	10	10	0.8[b]
ORR	119	0	[c]	10[d]	0
SRS	338	0	2[e]	2[e]	0

[a] Upgrade with RFETS and LANL materials.
[b] Upgrade with pits from RFETS.
[c] Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.
[d] Construct new Pu and HEU facilities.
[e] Net waste from new facility and from phaseout of existing facility.
Note: NA=not applicable.

Table 2.5.1–5. Maximum Annual Net Incremental Volume of Solid Hazardous Waste Over No Action Generated During Operation at Each Candidate Site

Site	Waste Generated in 2005 (m^3)	Upgrade (m^3)	Consolidation (m^3)	Collocation (m^3)	Preferred Alternative (m^3)
Hanford	560	4	2	2	0
NTS	212	NA	2	2	0
INEL	1,200	1	2	2	0
Pantex	31	2[a]	2	2	1.5[b]
ORR	26	0.8[c]	d	2[e]	0.8
SRS	15,100	0.8[a]	2	2	0.6[f]

[a] Upgrade with RFETS and LANL materials.
[b] Upgrade with pits from RFETS.
[c] Total of mixed LLW and hazardous waste because hazardous waste is included in mixed LLW.
[d] Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.
[e] Construct new Pu and HEU facilities.
[f] Upgrade with non-pit materials from RFETS.
Note: NA=not applicable.

Public and Occupational Health and Safety. Table 2.5.1–6 shows the differences between the long-term storage alternatives for radiological exposures to the public. The maximum potential latent cancer fatalities over No Action for the maximally exposed individual (MEI) over 50 years from normal operations ranges from 4.5×10^{-13} for the Upgrade and Preferred Alternatives at Pantex to 1.1×10^{-9} for the Collocation Upgrade Alternative at ORR. This means that the chance of a latent cancer fatality occurring ranges from about 1 in 1 billion to 5 in 10 trillion. The risk varies because of site parameters including the distance from the facility to the MEI (small sites vs. large sites); local meteorological conditions (windspeed, direction, and stability); and the type of material being stored (metals and oxides vs. residues).

Table 2.5.1–6. Maximum Latent Cancer Fatalities Over No Action for Maximally Exposed Individual for 50 Years From Normal Operation at Each Candidate Site

Site	No Action in 2005	Upgrade	Consolidation	Collocation	Preferred Alternative
Hanford	1.0×10^{-8}	4.5×10^{-11}	6.2×10^{-11}	6.2×10^{-11}	0
NTS	1.0×10^{-7}	NA	1.4×10^{-10}	1.4×10^{-10}	0
INEL	4.4×10^{-7}	1.3×10^{-11}	4.0×10^{-11}	4.0×10^{-11}	0
Pantex	1.5×10^{-9}	4.5×10^{-13}	2.4×10^{-10}	2.4×10^{-10}	4.5×10^{-13}
ORR	3.5×10^{-8}	5.5×10^{-13}	a	1.1×10^{-9}	5.5×10^{-13}
SRS	2.0×10^{-5}	2.1×10^{-10}	3.5×10^{-10}	3.5×10^{-10}	2.1×10^{-10}

[a] Since HEU is currently stored at ORR, the Consolidation and Collocation Alternatives would be the same.
Note: NA=not applicable.

Potential accidents were postulated for each of the long-term storage alternatives. The risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the accident scenario evaluated with the highest risk (PCV penetration by corrosion) for the Upgrade Alternative would be: 4.3×10^{-4} at Hanford; 1.6×10^{-3} at INEL; 8.8×10^{-4} at Pantex (Preferred Alternative); 3.0×10^{-5} at ORR (Preferred Alternative); and 4.6×10^{-4} at SRS. For both the Consolidation and Collocation Alternatives, the highest risk to the population located within 80 km (50 mi) of the accident release point associated with the accident scenarios evaluated (PCV penetration by corrosion) would be: 4.2×10^{-3} at Hanford; $5.1 \times 10^{-5}/9.4 \times 10^{-5}$ at NTS (P-Tunnel/New Pu and HEU Facility); 1.2×10^{-3} at INEL; 1.4×10^{-3} at Pantex; and 1.7×10^{-2} at ORR; and 4.6×10^{-3} at SRS. Since Pu accidents dominate the accident spectrum, the risks would be higher for the Consolidation and Collocation Alternatives then for the Upgrade Alternatives.

Intersite Transportation. For intersite transportation, the Upgrade and Preferred Alternatives would have lower potential for fatalities. For the Preferred Alternative, the number of potential fatalities ranges from 0 at Hanford and INEL (since there is no transport of material) to 0.06 at SRS. The Consolidation and Collocation Alternatives would have the higher potential for intersite transportation fatalities because they would move the greatest amount of material between sites. The number of potential fatalities ranges from 0.079 (Consolidated Storage Alternative at Pantex) to 1.07 (Collocated Storage Alternative at Hanford). Intersite transportation impacts would primarily result from nonradiological sources, such as fatalities from nonradiological traffic accidents.

2.5.2 DISPOSITION ALTERNATIVES

Table 2.5.2–1 depicts total campaign data for the disposition alternatives including the Preferred Alternative for disposition. A total of approximately 50 t (55.1 tons) of surplus Pu is assumed to be processed over the life of the campaign. In preparation for disposition under any alternative, surplus Pu must be processed through either the pit disassembly/conversion facility or the Pu conversion facility. Approximately 32.5 t (35.8 tons) are assumed to be processed at the pit disassembly/conversion facility, and approximately 17.5 t (19.3 tons) at the Pu conversion facility. Since these two facilities produce the input material for the other disposition facilities, actions at these two facilities would be the first to occur for the campaign. The operating period for these two facilities for each disposition alternative, including the Preferred Alternative, is 10 years.

Table 2.5.2–1. Total Campaign Data (Approximate) for Disposition Alternatives and the Preferred Alternative

	Disposition Alternatives			Preferred Alternative		
Action	Total Pu (t)	Throughput (t/yr)	Years In Operation	Total Pu (t)	Throughput (t/yr)	Years In Operation
Pit disassembly/ conversion	32.5	3.25	10	32.5	3.25	10
Pu conversion	17.5	1.75	10	17.5	1.75	10
Direct to borehole	50	5	10	NA	NA	NA
Immobilized to borehole	50	5	10	NA	NA	NA
Vitrification	50	5	10	17.5[a]	5[a]	3.5[a]
Ceramic immobilization	50	5	10	17.5[a]	5[a]	3.5[a]
Electrometallurgical treatment	50	5	10	NA	NA	NA
MOX fuel fabrication	50	3	17	32.5	3	11
5 existing LWRs[b]	50	3	17	32.5	3	11
2 partially completed LWRs[c]	50	3	17	NA	NA	NA
2 large or 4 small evolutionary LWRs	50	3	17	NA	NA	NA
CANDU reactors[d]	50	3.8	13	NA	NA	NA

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

[b] Three to five existing LWRs would be used depending upon the amount of MOX fuel in the reactor core.

[c] If the partially completed LWRs were to be completed by other parties, they would be considered existing LWRs and could compete for the surplus Pu disposition mission under the Preferred Alternative.

[d] The CANDU reactor is retained in the event a multilateral agreement is made among Russia, Canada, and the United States to use CANDU reactors.

Note: NA=not applicable.

The operation of the disposition facilities for a single disposition alternative would require between 10 and 17 years to accomplish the disposition mission. However, the Preferred Alternative may result in fewer years of operation for the disposition facilities, since the 50 t (55.1 tons) of surplus Pu would be dispositioned under two different technologies. For purposes of analysis, it is assumed that approximately 17.5 t (19.3 tons) of surplus Pu would be immobilized through vitrification or ceramic immobilization, and approximately 32.5 t (35.8 tons) would be converted to MOX fuel for use in reactors,[21] under the Preferred Alternative. The number of years in operation for each disposition technology may be less than that required to process the full 50 t (55.1 tons) with any single disposition alternative.

Actual years of operation and Pu throughput rates for any of the reactor disposition alternatives would not exceed 17 years and 3.8 t/yr (4.2 tons/yr), respectively, but could be less depending upon the final reactor core design. Variables such as the amount of MOX fuel included in each core have not yet been determined and would affect the years required to complete the mission using the reactor alternatives. Conservative estimates for throughput and years in operation are presented for comparing the Reactor Alternatives with the Preferred Alternative.

Table 2.5.2–2 presents a comparison of the total campaign impacts from the disposition of 50 t (55.1 tons) of surplus Pu for key environmental resources for the individual disposition alternatives and the Preferred Alternative. Since the ceramic immobilization facility generally has greater impacts than the vitrification facility, it was used in the calculation of the total campaign impacts for the Preferred Alternative. A comparison of impacts is not included for community services, environmental justice, and noise since the impacts are highly site-specific.

Biological, Geology and Soil, Land Use, and Cultural and Paleontological Resources. Ground disturbance during construction activities would potentially impact soil; biological; cultural resources (including historic, prehistoric, and Native American); and paleontological resources for all of the disposition alternatives. The immobilization alternatives would disturb the least amount of land while the Evolutionary LWR Alternative would disturb the most land area because it would require the most new construction. However, when considering operational land area, the two Deep Borehole Alternatives would require the most land because of the 1.6-km (1-mi) radius buffer zone. Depending upon location, all of the alternatives could result in visual resource impacts by changing the visual resource management classification of an area. The Deep Borehole Alternatives would impact geologic resources because the borehole operations would render the site perpetually unusable.

Site Infrastructure and Water Resources. The evolutionary LWR would require the largest electrical load during operations. The Evolutionary LWR and the Partially Completed LWR Alternatives would require the most additional water for operations. The rest of the alternatives would require nearly the same amount of water, with the exception of the Electrometallurgical Treatment Alternative, which would require the least amount of water.

Air Quality and Socioeconomics. Potential construction-related impacts on air quality and local transportation would be minor for all of the disposition alternatives and the Preferred Alternative. The Evolutionary LWR and Partially Completed LWR Alternatives would generate the most employment and income among the alternatives. For local transportation, the Evolutionary LWR would have the greatest potential of reducing the level of service on local roads during construction and/or operations. Some reduction in level of service would also be expected for the Vitrification, Ceramic Immobilization, and the Preferred Alternatives.

Public and Occupational Health and Safety. There would be potential for impacts to public and occupational health and safety from the radiological and hazardous chemical doses during operations of all the disposition

[21] The actual amount dispositioned under each disposition technology would depend on subsequent NEPA analysis, costs, test and demonstration results, international agreements, and the procurement process, among other things.

Table 2.5.2–2. Comparison of Resource Use and Impacts From the Total Campaign for the Operation of Disposition Alternatives[a]

Alternatives	Total Number of Worker-Years	Water Usage (million l)	Latent Cancer Fatalities for MEI from Lifetime Accident-Free Operation	Solid TRU Waste Generated (m^3)	Solid Low-Level Waste Generated (m^3)	Solid Hazardous Waste Generated (m^3)
Direct to borehole	20,550	3,405	1.2×10^{-9} to 1.2×10^{-7}	3,452	18,500	287
Immobilized to borehole	29,550	6,605	1.2×10^{-9} to 1.2×10^{-7}	4,955	18,740	497
Vitrification	24,810	4,251	1.2×10^{-9} to 1.2×10^{-7}	4,440	18,590	307
Ceramic immobilization	25,730	4,251	1.2×10^{-9} to 1.2×10^{-7}	4,440	18,590	307
Electrometallurgical treatment	17,960	1,751	1.2×10^{-9} to 1.3×10^{-7}	3,510	19,000	125
5 existing LWRs[b]	29,030	2,717	1.3×10^{-6} to 2.6×10^{-6}	8,652	21,051	2,718
2 partially completed LWRs[c]	47,305	2,352,000	9.8×10^{-6} to 9.9×10^{-6}	8,652	22,955 to 42,709	3,636
2 evolutionary large LWRs[d]	53,850	2,062,000	5.8×10^{-7} to 8.2×10^{-5}	8,652	38,051	3,636
4 evolutionary small LWRs[e]	59,630	1,856,000	8.4×10^{-7} to 9.6×10^{-5}	8,652	39,411	4,554
CANDU reactors[f]	25,630	2,717	1.8×10^{-9} to 1.2×10^{-7}	8,652	21,051	2,718
Preferred Alternative[g]	16,140	3,253	9.0×10^{-7} to 1.7×10^{-6}	7,163	20,182	1,866

[a] Data includes all front-end processes (Pu conversion, pit disassembly/conversion, and MOX fuel fabrication) that would be needed for the individual alternatives. The total campaign impacts were calculated by multiplying the annual impacts times the number of years of operation, as identified in Table S.8–7.

[b] The table reflects the use of 5 existing LWRs. Three to five existing LWRs would be used depending upon the amount of MOX fuel in the reactor core.

[c] The table reflects the use of 2 partially completed LWRs.

[d] The table reflects the use of 2 evolutionary large LWRs.

[e] The table reflects the use of 4 evolutionary small LWRs.

[f] The table reflects impacts from pit disassembly/conversion and MOX fuel fabrication in the United States.

[g] Ceramic immobilization and five existing LWRs are the assumed technologies for the Preferred Alternative for comparative purposes only.

alternatives, including the Preferred Alternative; however, the annual radiological doses to onsite workers and the public would be within regulatory limits for all alternatives. For hazardous chemicals, potential impacts to the public and onsite workers would not be expected to cause adverse health affects.

A set of potential accidents was postulated for each of the disposition technology alternatives. The risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the front-end disposition process campaign would range from 4.5×10^{-16} to 1.7×10^{-4} for pit disassembly/conversion (for the highest accident risk scenario [fire on loading dock] at the potential disposition sites: 4.6×10^{-5} at Hanford;

1.4×10^{-5} at INEL; 1.6×10^{-5} at Pantex; and 5.0×10^{-5} at SRS) and from 1.5×10^{-16} to 1.3×10^{-4} for Pu conversion (for the highest accident risk scenario [fire on loading dock] at the potential disposition sites: 3.5×10^{-5} at Hanford and 3.2×10^{-5} at SRS). Within the borehole category, the risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for direct disposition campaign would range from 8.4×10^{-16} to 6.3×10^{-8}. For both the ceramic immobilization front-end process prior to immobilized disposal, and ultimate disposition in the deep borehole complex, the risks would range from 9.3×10^{-18} to 6.3×10^{-8} and 9.3×10^{-19} to 6.3×10^{-9}, respectively for the disposition campaign. The risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the immobilization category would range from 2.8×10^{-14} to 1.8×10^{-5} for the vitrification alternative and from 7.0×10^{-16} to 1.9×10^{-7} for the ceramic immobilization alternative over the disposition campaign (for the highest accident scenario [criticality] at the potential disposition sites and 30 percent immobilization campaign: 1.7×10^{-8} at Hanford and 2.1×10^{-8} at SRS). For the immobilization of Pu through electrometallurgical treatment of spent fuels, the projected campaign risk to the population would be 3.5×10^{-7} for the accident scenario evaluated with the highest risk (a breach in the argon cell initiated by a design basis earthquake).

For the reactor alternative, the risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the MOX fuel fabrication facility would range from 4.6×10^{-16} to 4.3×10^{-4} for the campaign (for the highest accident scenario [fire on loading dock] at the potential disposition sites using for analysis purposes, approximately 70 percent disposition campaign: 5.2×10^{-5} at Hanford; 1.6×10^{-5} at INEL; 1.8×10^{-5} at Pantex; and 5.2×10^{-5} at SRS). The risk of cancer fatalities to the population located within 80 km (50 mi) of the accident release point for the MOX-fueled evolutionary LWR would range from 9.6×10^{-11} to 6.9×10^{-6}. Under the Preferred Alternative, DOE would pursue the use of MOX-fueled LWRs. The incremental effects of utilizing MOX fuel in a reactor in place of UO_2 were derived from a quantitative analysis of severe accident release scenarios for MOX and UO_2 using the MACCS computer code and generic population and meteorology data. The analysis only considers severe accidents where sufficient damage would occur to cause the release of Pu or uranium. The risks of severe accidents were found to be in the range of plus 8 to minus 7 percent, compared to UO_2 fuel, depending on the accident release scenario. The incremental risk of cancer fatalities to a generic population located within 80 km (50 mi) of the severe accident release point would range from -2.0×10^{-4} to 3.0×10^{-5} per year.

Waste Management. The reactor alternatives and the Preferred Alternative would be the only alternatives that would generate spent nuclear fuel. The Partially Completed LWR Alternative would generate the largest incremental increase in spent nuclear fuel. The Preferred Alternative would generate the lowest incremental increase of spent nuclear fuel among the reactor alternatives because the combination of disposition technologies would require less Pu to go through reactors. The reactor alternatives and the Preferred Alternative would also generate the most solid TRU, solid low-level, and solid hazardous waste among the alternatives.

Intersite Transportation. The Evolutionary LWR and Partially Completed LWR Alternatives would have the highest potential fatalities over the total campaign because they would require the most material transport. The Preferred Alternative and Electrometallurgical Treatment Alternative would have the lowest potential fatalities from transportation. Intersite transportation impacts would primarily be the result of nonradiological impacts such as fatalities from nonradiological highway accidents.

Table 2.5–1

Summary of Environmental Impacts for the Preferred Alternative for Storage

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Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Land Resources							
Refer to No Action.	Refer to No Action.	Refer to No Action.	Land area requirements for *Modify Existing Zone 12* would be 0.18 ha during construction, of which 0.1 ha would be used during operation. However, the facility would be situated on previously disturbed land. A buffer zone would be established between the facility and the site boundary.	*Modify Existing Y–12 Plant* would utilize existing facilities with no modifications of the exterior of the facility. Land area would not be disturbed nor would additional land be required. A buffer zone would be provided between the facility and the site boundary.	*Modify Actinide Packaging and Storage Facility* within an existing previously disturbed protected area. The entire protected area would be required during operation. A buffer zone is provided between the facility and the site boundary.	No new construction or modification of existing facilities would occur under phaseout of the storage mission.	Refer to No Action.

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Site Infrastructure							
Refer to No Action.	Refer to No Action.	Refer to No Action.	Construction and operation of the *Modify Existing Zone 12* would not affect site infrastructure. Only electrical energy usage would increase over no action. Operation would increase site infrastructure needs above current site availability as follows:	There would be no affect on site infrastructure for *Modify Existing Y–12 Plant* during construction. Operational impact for *Modify Existing Y–12 Plant* would increase site infrastructure above current site availability needs as follows:	Construction of the *Modify Actinide Packaging and Storage Facility* would not affect site infrastructure. Operation effects would be minimal and would increase site infrastructure needs above current site availability as follows:	Phaseout would not affect site infrastructure.	Refer to No Action.
			Electrical Energy (EE): 0 MWh/yr	EE: 0 MWh/yr	EE: 0 MWh/yr		
			Peak Electric Load (PEL): 0 MWe	PEL: 0 MWe	PEL: 0 MWe		
			Oil: 0 l/yr	Oil: 0 l/yr	Oil: 0 l/yr		
			Gas: 0 m^3/yr	Gas: 0 m^3/yr	Gas: 0 m^3/yr		
			Coal: 0 t/yr.	Coal: 160 t/yr.	Coal: 290 t/yr.		

Table 2.5–1. *Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Air Quality and Noise							
For this resource, there are no discriminatory impacts for the eight sites under consideration.							

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Water Resources							
Refer to No Action.	Refer to No Action.	Refer to No Action.	The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during construction would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Y–12 Plant* during construction would be 0.02/0.1.	The total percent increase in surface water use/discharge for *Modify Actinide Packaging and Storage Facility* during construction would be 0/0.	There would be no impact to surface water flow or water quality. Phaseout would not result in an incremental change in the total wastewater volume handled.	Refer to No Action.
			The total percent increase in groundwater use/ discharge for *Modify Existing Zone 12* during construction would be 2.6/2.2.	The total percent increase in groundwater use/ discharge for *Modify Existing Y–12 Plant* during construction would be 0/0.	The total percent increase in groundwater use/ discharge for *Modify Actinide Packaging and Storage Facility* during construction would be 0.02/0.2.	There would be no impact on groundwater availability, since RFETS does not withdraw groundwater. There would be no impact to groundwater quality associated with the phaseout.	
			The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during operation would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Y–12 Plant* during operation would be $2.0 \times 10^{-3}/9.0 \times 10^{-5}$.	The total percent increase in surface water use/discharge for *Modify Actinide Packaging and Storage Facility* during operation would be 0/0.		

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Water Resources (continued)							
Refer to No Action.	Refer to No Action.	Refer to No Action.	The total percent increase in groundwater use/ discharge for *Modify Existing Zone 12* during operation would be 11/9.1.	The total percent increase in groundwater use/ discharge for *Modify Existing Y–12 Plant* during operation would be 0/0.	The total percent increase in groundwater use/ discharge for *Modify Actinide Packaging and Storage Facility* during operation would be 0.04/0.2.		Refer to No Action.

Table 2.5–1. ***Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued***

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Geology and Soils							
For this resource, there are no discriminatory impacts for the eight sites under consideration.							

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Biological Resources							
Refer to No Action.	Refer to No Action.	Refer to No Action.	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing Zone 12 Facility.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing Y–12 Plant.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Actinide Packaging and Storage Facility.*	Phaseout is not expected to affect biological resources.	Refer to No Action.

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Cultural and Paleontological Resources							
Refer to No Action.	Refer to No Action.	Refer to No Action.	It is unlikely that NRHP-eligible prehistoric and historic resources exist within the previously disturbed 0.18 ha of land area for the *Modify Existing Zone 12*. Operation would not result in additional impact.	Building modifications are proposed for four NRHP-eligible resources for *Modify Existing Y–12 Plant*.	Some NRHP-eligible prehistoric and historic resources may exist within the construction area for *Modify Actinide Packaging and Storage Facility*. Operation would not result in additional impact.	There are no impacts anticipated for prehistoric resources; some of the historic sites at RFETS, may be affected through alteration if subsequently proposed.	Refer to No Action.
			Some Native American resources would be affected by construction and operation of the *Modify Existing Zone 12*.	It is unlikely that Native American resources would be affected by construction or operation for *Modify Existing Y–12 Plant*.	Some Native American resources may be affected by construction and operation of the *Modify Actinide Packaging and Storage Facility*.	Native American resources would not be affected by phaseout of Pu storage.	
			Some paleontological resources would be affected by the construction and operation of the *Modify Existing Zone 12*.	No activity is planned that would affect paleontological resources for *Modify Existing Y–12 Plant*.	SRS does not contain scientifically valuable paleontological remains.	Paleontological resources would not be affected by phaseout of Pu storage.	

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Socioeconomics							
Refer to No Action.	Refer to No Action.	Refer to No Action.	During peak construction/ operation total employment would increase by much less than 1 percent/ less than 1 percent over No Action.	During peak construction/ operation total employment would increase by much less than 1 percent/ much less than 1 percent over No Action.	During peak construction/ operation total employment would increase by much less than 1 percent/ much less than 1 percent over No Action.	Should all personnel be phased out at the same time, unemployment would increase to 4.6 percent.	Refer to No Action.
			Local transportation would change from free flow to a restricted condition during construction. Local transportation would not change appreciably during operation.	Local transportation would not change appreciably.	Local transportation would change from a restricted condition to a further restricted condition during construction. Local transportation would not be affected during operation.		

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Public and Occupational Health and Safety							
Normal Radiological Impacts							
Refer to No Action.	Refer to No Action.	Refer to No Action.	The annual dose from the *Modify Existing Zone 12 Storage Facility* to the MEI of the public would be $<1.8x10^{-8}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $<4.5x10^{-13}$ from 50 years of operation.	The annual dose from the *Modify Existing Y–12 Plant Storage Facility* to the MEI of the public would be $2.2x10^{-7}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $5.5x10^{-12}$ from 50 years of operation.	The annual dose from the *Modify Actinide Packaging and Storage Facility* to the MEI of the public would be $6.8x10^{-6}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $1.7x10^{-10}$ from 50 years of operation.	Phaseout would reduce the impacts from radiological releases and exposures to levels below the No Action levels.	Refer to No Action.
			The annual dose from the *Modify Existing Zone 12 Storage Facility* to the public within 80 km would be $<6.3x10^{-6}$ person-rem. The estimated number of fatal cancers to the public is $<1.6x10^{-7}$ from 50 years of operation.	The annual dose from the *Modify Existing Y–12 Plant Storage Facility* to the public within 80 km would be $3.4x10^{-6}$ person-rem. The estimated number of fatal cancers to the public is $8.5x10^{-8}$ from 50 years of operation.	The annual dose from the *Modify Actinide Packaging and Storage Facility* to the public within 80 km would be $2.9x10^{-4}$ person-rem. The estimated number of fatal cancers to the public is $7.2x10^{-6}$ from 50 years of operation.		
			The average annual dose from the *Modify Existing Zone 12 Storage Facility* to the involved worker would be 116 mrem. The estimated fatal cancer risk for the average involved worker would be $2.3x10^{-3}$ from 50 years of operation.	The average annual dose from the *Modify Existing Y–12 Plant Storage Facility* to the involved worker would be 28 mrem. The estimated fatal cancer risk for the average involved worker would be $5.6x10^{-4}$ from 50 years of operation.	The average annual dose from the *Modify Actinide Packaging and Storage Facility* to the involved worker would be 250 mrem. The estimated fatal cancer risk for the average involved worker would be $5.0x10^{-3}$ from 50 years of operation.		

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Public and Occupational Health and Safety (continued)							
Normal Radiological Impacts (continued)							
Refer to No Action.	Refer to No Action.	Refer to No Action.	The annual total dose from the *Modify Existing Zone 12 Storage Facility* to the involved workforce would be 3 person-rem, which would result in an estimated 0.060 fatal cancer from 50 years of operation.	The annual total dose from the *Modify Existing Y–12 Plant Storage Facility* to the involved workforce would be 3 person-rem, which would result in an estimated 0.060 fatal cancer from 50 years of operation.	The annual dose from the *Modify Actinide Packaging and Storage Facility* to the total involved workforce would be 7.5 person-rem, which would result in an estimated 0.15 fatal cancer from 50 years of operation.	Phaseout would reduce the impacts from radiological releases and exposure to levels below the No Action level.	Refer to No Action.

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
				Preferred Alternative			
Public and Occupational Health and Safety (continued)							
Hazardous Chemical Impacts							
Refer to No Action.	Refer to No Action.	Refer to No Action.	The Hazard Index (HI) and cancer risk for the public for *Modify Existing Zone 12* would be 0 and 0, respectively.	The HI and cancer risk for the public for *Modify Existing Y–12 Plant* would be 8.6×10^{-5} and 0, respectively.	The HI and cancer risk for the public for *Modify Actinide Packaging and Storage Facility* would be 1.5×10^{-6} and 0, respectively.	Phaseout would reduce the impacts from chemical releases and exposures to levels below the No Action levels.	Refer to No Action.
			The HI and cancer risk for the worker for *Modify Existing Zone 12* would be 0 and 0, respectively.	The HI and cancer risk for the worker for *Modify Existing Y–12 Plant* would be 5.7×10^{-4} and 0, respectively.	The HI and cancer risk for the worker for *Modify Actinide Packaging and Storage Facility* would be 2.1×10^{-4} and 0, respectively.		

Table 2.5–1. *Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Public and Occupational Health and Safety (continued)							
Facility Accidents							
Refer to No Action.	Refer to No Action.	Refer to No Action.	Based on the estimated maximum impacts from a set of accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing Zone 12*, the probability of cancer/risk to worker would be $7.2x10^{-6}/1.4x10^{-5}$.	Based on the estimated maximum impacts from a set of accidents analyzed for environmental assessment analyses, the maximum impacts and annual facility lifetime risks for *Modify Existing Y–12 Plant*, would be reduced approximately 80 percent for the expected risk, resulting in a latent cancer fatality risk of $5.7x10^{-8}$ to worker.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Actinide Packaging and Storage Facility*, the probability of cancer/risk to worker would be $1.2x10^{-5}/2.9x10^{-6}$.	The phaseout operation will be conducted in accordance with DOE safety orders to ensure that the risk to the public of prompt fatalities due to accidents or of cancer fatalities due to operations will be minimized.	Refer to No Action.
			Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing Zone 12*, the probability of the cancer/risk to the MEI would be $2.9x10^{-6}/5.8x10^{-6}$.	Based on the estimated maximum impacts from a set of potential accidents analyzed for environmental assessment analyses, the maximum impacts and annual facility lifetime risks for *Modify Existing Y–12 Plant*, would be reduced approximately 80 percent for the expected risk, resulting in a latent cancer fatality risk of $5.1x10^{-7}$ to the MEI.	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Actinide Packaging and Storage Facility*, the probability the of cancer/risk to the MEI would be $2.9x10^{-7}/7.0x10^{-8}$.		

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Public and Occupational Health and Safety (continued)							
Facility Accidents (continued)							
Refer to No Action.	Refer to No Action.	Refer to No Action.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing Zone 12* would be: Population: Cancer fatalities: $4.4x10^{-4}$ Cancer fatalities risk: $8.8x10^{-4}$.	Based on the estimated maximum impacts from a set of potential accidents analyzed for environmental assessment analyses, the maximum impacts and annual facility lifetime risks for *Modify Existing Y–12 Plant* would be reduced approximately 80 percent for the expected risk, resulting in a latent cancer fatality risk of $7.4x10^{-6}$ to population.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Actinide Packaging and Storage Facility* would be: Population: Cancer fatalities: $1.4x10^{-3}$ Cancer fatalities risk: $3.4x10^{-4}$.	The phaseout operation will be conducted in accordance with DOE safety orders to ensure that the risk to the public of prompt fatalities due to accidents or of cancer fatalities due to accidents.	Refer to No Action.

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Waste Management							
Refer to No Action.	Refer to No Action.	Refer to No Action.	The annual net increase in generation due to *Modify Existing Zone 12 South* for liquid/solid would be as follows:	The annual net increase in generation due to *Modify Existing Y–12 Plant* for liquid/solid would be as follows:	The net annual increase or decrease in generation due to *Modify Actinide Packaging and Storage Facility* for liquid/solid would be as follows:	The waste associated with Pu storage would no longer be generated, but the total wastes generated at RFETS could increase due to cleanup activities at formerly used Pu storage facilities.	Refer to No Action.
			TRU: 0 m^3/0.8 m^3	TRU: 0 m^3/0 m^3	TRU: 0 m^3/0 m^3		
			Mixed TRU: 0 m^3/ 0 m^3	Mixed TRU: 0 m^3/ 0 m^3	Mixed TRU: 0 m^3/ 0 m^3		
			LLW: 0.08 m^3/ 138 m^3	LLW: 0.04 m^3/ 3 m^3	LLW: 0 m^3/ 0 m^3		
			Mixed LLW: 0.2 m^3/ 8 m^3	Mixed LLW: 0.02 m^3/0.8 m^3	Mixed LLW: 0 m^3/ 0 m^3		
			HAZ: 1 m^3/1.5 m^3	HAZ: Included in Mixed LLW/ Included in Mixed LLW	HAZ: 0 m^3/ 0.56 m^3		
			Nonhaz (sanitary): 12,900 m^3/275 m^3	Nonhaz (sanitary): 0.8 m^3/31 m^3	Nonhaz (sanitary): 1,490 m^3/13 m^3		
			Nonhaz (other): Included in sanitary/344 m^3.	Nonhaz (other): 0.8 m^3/0.8 m^3.	Nonhaz (other): Included in sanitary/13 m^3.		

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Intersite Transportation of Fissile Materials[a]							
Refer to No Action.	Refer to No Action.	Refer to No Action.	Transport of RFETS Pu pits to Pantex would have maximum potential fatalities of $6.4x10^{-3}$.	This resource does not apply at ORR.	Transport of all non-pit materials to SRS would have maximum potential fatalities of 0.06.	The risk associated with transport of RFETS materials would be 0.067.	Refer to No Action.

[a]Detailed information is provided in the classified Appendix.

Table 2.5–1. Summary of Environmental Impacts for the Preferred Alternative for Storage—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Preferred Alternative							
Environmental Justice							
Refer to No Action.	Refer to No Action.	Refer to No Action.	No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	Impacts would not disproportionately affect minority or low-income populations.	Refer to No Action.

Table 2.5–2

Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives

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Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Land Resources							
Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.	Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.	Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.	Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.	Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.	Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.	Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.	Land use would be in conformance with existing land-use plans, policies, and controls, and the visual landscape would remain compatible.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Site Infrastructure							
The infrastructure can accommodate all missions and functions.	The infrastructure can accommodate all missions and functions.	The infrastructure can accommodate all missions and functions.	A considerable reduction in site infrastructure requirements would occur.	Some additional coal would be needed. All other resources are greater than projected usage.	The infrastructure can accommodate all missions and functions.	The infrastructure can accommodate all missions and functions.	The infrastructure can accommodate all missions and functions.
During operation projected use would be as follows:	During operation projected use would be as follows:	During operation projected use would be as follows:	During operation projected use would be as follows:	During operation projected use would be as follows:	During operation projected use would be as follows:	During operation projected use would be as follows:	During operation projected use would be as follows:
EE: 345,500 MWh/yr	EE: 124,940 MWh/yr	EE: 232,500 MWh/yr	EE: 46,266 MWh/yr	EE: 726,000 MWh/yr	EE: 794,000 MWh/yr	EE: 184,000 MWh/yr	EE: 381,425 MWh/yr
PEL: 58 MWe	PEL: 25 MWe	PEL: 42 MWe	PEL: 10 MWe	PEL: 110 MWe	PEL: 116 MWe	PEL: 26 MWe	PEL: 87 MWe
Oil: 9,334,800 l/yr	Oil: 5,716,000 l/yr	Oil: 5,820,000 l/yr	Oil: 795,166 l/yr	Oil: 379,000 l/yr	Oil: 28,390,500 l/yr	Oil: 8,140,000 l/yr	Oil: 0 l/yr
Gas: 21,039,531 m^3/yr	Gas: 0 m^3/yr	Gas: 0 m^3/yr	Gas: 7,200,000 m^3/yr	Gas: 95,000,000 m^3/yr	Gas: 0 m^3/yr	Gas: 18,600,000 m^3/yr	Gas: 43,414,560 m^3/yr
Coal: 0 t/yr.	Coal: 0 t/yr.	Coal: 11,340 t/yr.	Coal: 0 t/yr.	Coal: 16,300 t/yr.	Coal: 221,352 t/yr.	Coal: 0 t/yr.	Coal: 0 t/yr.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Air Quality and Noise							
Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.	Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.	Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.	Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.	Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.	Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.	Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.	Concentrations of criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable ambient air quality standards. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside the scope of this PEIS) under the no action alternative.
No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.	No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.	No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.	No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.	No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.	No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.	No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.	No appreciable change in traffic noise and onsite operational noise sources from current levels would occur. Some noise sources may impact onsite sensitive areas, such as disturbance of wildlife.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Water Resources							
Withdrawal of 13,511 MLY of surface water and 195 MLY of ground water would occur during operations.	No surface water would be used at NTS. Withdrawal of 2,400 MLY of groundwater would occur during operations.	No surface water would be used at INEL. Withdrawal of 7,570 MLY of groundwater would occur during operations.	No surface water would be used at Pantex. Withdrawal of 249 MLY of groundwater would occur during operations.	Withdrawal of 14,760 MLY of water would continue from surface water. No groundwater would be used at ORR for this mission.	Withdrawal of 127,000 MLY of surface water and 13,247 MLY of groundwater would occur during operations.	Withdrawal of 439 MLY from municipal water supplies would occur during operations. No additional impacts to groundwater are anticipated.	Withdrawal of 5,760 MLY from groundwater would occur during operations.
Quantities of wastewater (246 MLY) would be generated and discharged to evaporation/ infiltration ponds.	Quantities of wastewater (82 MLY) would be generated and discharged to evaporation/ infiltration ponds.	Quantities of wastewater (540 MLY) would be generated and discharged to evaporation/ infiltration ponds.	Quantities of wastewater (141 MLY) would be generated and discharged to the playas.	Quantities of wastewater (2,277 MLY) would be generated, treated, and discharged to nearby streams.	Quantities of wastewater (700 MLY) would be generated, treated, and discharged to nearby streams.	Quantities of wastewater (130 MLY) would be generated, treated, and discharged to nearby streams. Groundwater remediation removals decrease from 10.6 MLY to 7.8 MLY.	Quantities of wastewater (693 MLY) would be generated, treated, and discharged to nearby canyons.

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Geology and Soils							
There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to geologic or soil resources because no construction activities would occur for No Action beyond those associated with existing and future site improvements.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Biological Resources							
There would be no impact to biotic resources.	There would be no impact to biotic resources.	There would be no impact to biotic resources.	There would be no impact to biotic resources.	There would be no impact to biotic resources.	There would be no impact to biotic resources.	There would be no impact to biotic resources.	There would be no impact to biotic resources.

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Cultural and Paleontological Resources							
There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.	There would be no impact to cultural and paleontological resources because no construction would occur for No Action beyond those associated with existing and future site improvements.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Socioeconomics							
Employment in the economic study area is expected to grow less than 1 percent annually to the year 2040.	Employment in the economic study area is expected to grow 2 percent annually to the year 2040.	Employment in the economic study area is expected to grow about 1 percent annually to the year 2040.	Employment in the economic study area is expected to grow less than 1 percent annually to the year 2040.	Employment in the economic study area is expected to grow less than 1 percent annually to the year 2040.	Employment in the economic study area is expected to grow less than 1 percent annually to the year 2040.	Employment in the economic study area is expected to grow about 1 percent annually to the year 2040.	Employment in the economic study area is expected to increase over 1 percent annually to the year 2040.
Local transportation would not be affected.	Local transportation would not be affected.	Local transportation would not be affected.	Local transportation would not be affected.	Local transportation would not be affected.	Local transportation would not be affected.	Local transportation would not be affected.	Local transportation would not be affected.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Public and Occupational Health and Safety							
Normal Radiological Impacts							
The annual dose to the MEI of the public from total site operation would be $5.3x10^{-3}$mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $1.3x10^{-7}$.	The annual dose to the MEI of the public from total site operation would be $4.2x10^{-3}$ mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $1.0x10^{-7}$.	The annual dose to the MEI of the public from total site operation would be 0.018 mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $4.4x10^{-7}$.	The annual dose to the MEI of the public from total site operation would be $6.1x10^{-5}$mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $1.5x10^{-9}$.	The annual dose to the MEI of the public from total site operation would be 3.2 mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $8.0x10^{-5}$.	The annual dose to the MEI of the public from total site operation would be 0.79 mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $2.0x10^{-5}$.	The annual dose to the MEI of the public from total site operation would be 0.48 mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $1.2x10^{-5}$.	The annual dose to the MEI of the public from total site operation would be 6.5 mrem. The estimated risk of fatal cancer for the MEI from 50 years of operations would be $1.6x10^{-4}$.
The annual total dose to the public within 80 km from total site operation would be 1.6 person-rem. The estimated number of fatal cancers to the public is 0.039 as the result of 50 years of operation.	The annual total dose to the public within 80 km from total site operation would be $3.7x10^{-3}$ person-rem. The estimated number of fatal cancers to the public is $9.3x10^{-5}$ as the result of 50 years of operation.	The annual total dose to the public within 80 km from total site operation would be 2.4 person-rem. The estimated number of fatal cancers to the public is 0.061 as the result of 50 years of operation.	The annual total dose to the public within 80 km from total site operation would be $2.8x10^{-4}$ person-rem. The estimated number of fatal cancers to the public is $7.0x10^{-6}$ as the result of 50 years of operation.	The annual total dose to the public within 80 km from total site operation would be 34 person-rem. The estimated number of fatal cancers to the public is 0.85 as the result of 50 years of operation.	The annual total dose to the public within 80 km from total site operation would be 44 person-rem. The estimated number of fatal cancers to the public is 1.1 as the result of 50 years of operation.	The annual total dose to the public within 80 km from total site operation would be 0.10 person-rem. The estimated number of fatal cancers to the public is $2.5x10^{-3}$ as the result of 50 years of operation.	The annual total dose to the public within 80 km from total site operation would be 2.7 person-rem. The estimated number of fatal cancers to the public is 0.068 as the result of 50 years of operation.
The average annual dose to the site worker from total site operation would be 31 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $6.0x10^{-4}$.	The average annual dose to the site worker from total site operation would be 5.0 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $1.0x10^{-4}$.	The average annual dose to the site worker from total site operation would be 30 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $6.0x10^{-4}$.	The average annual dose to the site worker from total site operation would be 24 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $4.8x10^{-4}$.	The average annual dose to the site worker from total site operation would be 2.6 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $5.2x10^{-5}$.	The average annual dose to the site worker from total site operation would be 36 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $7.2x10^{-4}$.	The average annual dose to the site worker from total site operation would be 122 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $2.4x10^{-3}$.	The average annual dose to the site worker from total site operation would be 32 mrem. The fatal cancer risk for this worker from 50 years of operation is estimated to be $6.4x10^{-4}$.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Public and Occupational Health and Safety (continued)							
Normal Radiological Impacts (continued)							
The annual total dose to the site workforce would be 250 person-rem, which would cause an estimated 5.1 fatal cancers from 50 years of operation.	The annual total dose to the site workforce would be 3.0 person-rem, which would cause an estimated 0.060 fatal cancers from 50 years of operation.	The annual total dose to the site workforce would be 219 person-rem, which would cause an estimated 4.4 fatal cancers from 50 years of operation.	The annual total dose to the site workforce would be 34 person-rem, which would cause an estimated 0.68 fatal cancers from 50 years of operation.	The annual total dose to the site workforce would be 44 person-rem, which would cause an estimated 0.88 fatal cancers from 50 years of operation.	The annual total dose to the site workforce would be 259 person-rem, which would cause an estimated 5.2 fatal cancers from 50 years of operation.	The annual total dose to the site workforce would be 775 person-rem, which would cause an estimated 15 fatal cancers from 50 years of operation.	The annual total dose to the site workforce would be 183 person-rem, which would cause an estimated 3.7 fatal cancers from 50 years of operation.

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Public and Occupational Health and Safety (continued)							
Hazardous Chemical Impacts							
The HI and cancer risk for the public are 6.2×10^{-5} and 0, respectively.	The HI and cancer risk for the public are 0 and 0, respectively.	The HI and cancer risk for the public are 1.5×10^{-2} and 3.6×10^{-6}, respectively.	The HI and cancer risk for the public are 5.7×10^{-3} and 1.1×10^{-8}, respectively.	The HI and cancer risk for the public are 4.0×10^{-2} and 0, respectively.	The HI and cancer risk for the public are 5.2×10^{-3} and 1.3×10^{-7}, respectively.	The HI and cancer risk for the public are 1.2×10^{-3} and 2.1×10^{-8}, respectively.	The HI and cancer risk for the public are 3.0×10^{-2} and 5.2×10^{-6}, respectively.
The HI and cancer risk for the worker are 4.0×10^{-3} and 0, respectively.	The HI and cancer risk for the worker are 0 and 0, respectively.	The HI and cancer risk for the worker are 0.22 and 7.7×10^{-4}, respectively.	The HI and cancer risk for the worker are 6.1×10^{-3} and 4.5×10^{-7}, respectively.	The HI and cancer risk for the worker are 0.15 and 0, respectively.	The HI and cancer risk for the worker are 1.2 and 1.9×10^{-4}, respectively.	The HI and cancer risk for the worker are 1.3×10^{-2} and 2.3×10^{-6}, respectively.	The HI and cancer risk for the worker are 4.7×10^{-2} and 1.5×10^{-4}, respectively.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Public and Occupational Health and Safety (continued)							
Facility Accidents							
Pu storage would continue to be performed at the site with no change to facilities or operations.	No change to non-storage facilities and operations would occur. Under existing conditions, potential accidents and their consequences have previously been addressed and documented according to requirements in DOE Orders.	Pu storage would continue to be performed at the site with no change to facilities or operations.	Pu storage would continue to be performed at the site with no change to facilities or operations. Under existing conditions, potential accidents and their consequences have previously been addressed and documented according to requirements in DOE Orders.	Uranium storage would continue to be performed at the site with no change to facilities or operations. Under existing conditions, potential accidents and their consequences have previously been addressed and documented according to requirements in DOE Orders.	Pu storage would continue to be performed at the site with no change to facilities or operations. Under existing conditions, potential accidents and their consequences have previously been addressed and documented according to requirements in DOE Orders.	Pu storage would continue to be performed at the site with no change to facilities or operations. Under existing conditions, potential accidents and their consequences have previously been addressed and documented according to requirements in DOE Orders.	Pu storage would continue to be performed at the site with no change to facilities or operations. Under existing conditions, potential accidents and their consequences have previously been addressed and documented according to requirements in DOE Orders.
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point, for the No Action probability of cancer/risk to worker would be: $2.2x10^{-3}/2.2x10^{-10}$.		Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point, for the No Action probability of cancer/risk to worker would be: $0.02/2.0x10^{-9}$.					

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Public and Occupational Health and Safety (continued)							
Facility Accidents (continued)							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary, for the No Action probability of cancer/risk to worker for would be: $1.7x10^{-5}/1.7x10^{-12}$.		Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary, for the No Action probability of cancer/risk to worker for would be: $9.8x10^{-4}/9.8x10^{-11}$.					
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, for the No Action Alternative maximum impacts and 50-year facility lifetime risks would be:		Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, for the No Action Alternative maximum impacts and 50-year facility lifetime risks would be:					
Population: Cancer fatalities: 0.12 Cancer fatalities risk: $1.2x10^{-8}$.		Population: Cancer fatalities: 0.33 Cancer fatalities risk: $3.3x10^{-8}$.					

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Waste Management							
TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed. No impact to current waste management activities would occur.	Low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed. No impact to current waste management activities would occur.	TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed. No impact to current waste management activities would occur.	Low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed. No impact to current waste management activities would occur.	TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed. No impact to current waste management activities would occur.	TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed. No impact to current waste management activities would occur.	TRU, low-level, mixed, hazardous, nonhazardous wastes would continue to be managed. No impact to current waste management activities would occur.	TRU, low-level, mixed, hazardous, nonhazardous wastes would continue to me managed. No impact to current waste management activities would occur.
Annual total site generation rates for liquid/solid would be as follows:	Annual total site generation rates for liquid/solid would be as follows:	Annual total site generation rates for liquid/solid would be as follows:	Annual total site generation rates for liquid/solid would be as follows:	Annual total site generation rates for liquid/solid would be as follows:	Annual total site generation rates for liquid/solid would be as follows:	Annual total site generation rates for liquid/solid would be as follows:	Annual total site generation rates for liquid/solid would be as follows:
SNF: 0 m^3/0 m^3	SNF: Not generated	SNF: 0 m^3/0 m^3	SNF: Not generated	SNF: Not generated	SNF: 0 m^3/0 m^3	SNF: Not generated	SNF: Not generated
HLW: 0 m^3/0 m^3	HLW: Not generated	HLW: 538 m^3/192 m^3	HLW: Not generated	HLW: Not generated	HLW: 126 m^3/ 127 m^3	HLW: Not generated	HLW: Not generated
TRU: 0 m^3/271 m^3	TRU: 0 m^3/0 m^3	TRU: 0 m^3/3.5 m^3	TRU: 0 m^3/0 m^3	TRU: 0 m^3/119 m^3	TRU: 0 m^3/338 m^3	TRU:<1 m^3/ 1,583 m^3	TRU: 0.1 m^3/54 m^3
Mixed TRU: 0 m^3/ 98 m^3	Mixed TRU: 0 m^3/ 0 m^3	Mixed TRU: 0 m^3/ Included in TRU	Mixed TRU: 0 m^3/ 0 m^3	Mixed TRU: 0 m^3/ 0 m^3	Mixed TRU: 0 m^3/ Included in TRU	Mixed TRU: <1 m^3/ 1,505 m^3	Mixed TRU: 0 m^3/ 255 m^3
LLW: 0 m^3/3,390 m^3	LLW: Dependent on restoration activities/ 15,000 m^3	LLW: 0 m^3/7,200 m^3	LLW: 8 m^3/32 m^3	LLW: 2,970 m^3/ 7,320 m^3	LLW: 74,000 m^3/ 16,400 m^3	LLW: <1 m^3/701 m^3	LLW: 21,400 m^3/ 2,690 m^3
Mixed LLW: 3,760 m^3/ 1,505 m^3	Mixed LLW: 0 m^3/ 50 m^3	Mixed LLW: 4 m^3/ 170 m^3	Mixed LLW: 4 m^3/ 46 m^3	Mixed LLW: 87,600 m^3/ 432 m^3	Mixed LLW: 1,330 m^3/ 7,700 m^3	Mixed LLW: 0 m^3/ 6,019 m^3	Mixed LLW: 0 m^3/ 45 m^3
HAZ: Included in solid/560 m^3	HAZ: Included in solid/212 m^3	HAZ: Included in solid/1,200 m^3	HAZ: 2 m^3/31 m^3	HAZ: 6,460 m^3/ 26 m^3	HAZ: 1,260 m^3/ 15,100 m^3	HAZ: <1 m^3/25 m^3	HAZ: 273 m^3/ 669 m^3
Nonhaz (sanitary): 414,000 m^3/ 5,107 m^3	Nonhaz (sanitary): Included in solid/2,120 m^3	Nonhaz (sanitary): Included in solid/52,000 m^3	Nonhaz (sanitary): 141,000 m^3/339 m^3	Nonhaz (sanitary): 550,000 m^3/ 53,100 m^3	Nonhaz (sanitary): 703,000 m^3/ 61,200 m^3	Nonhaz (sanitary): 457,600 m^3/ 11,400 m^3	Nonhaz (sanitary): 692,827 m^3/ 5,453 m^3
Nonhaz (other): Included in sanitary/Included in sanitary.	Nonhaz (other): Included in sanitary/76,500 m^3.	Nonhaz (other): 0 m^3/Included in sanitary.	Nonhaz (other): Included in liquid sanitary/Included in solid sanitary.	Nonhaz (other): 650,000 m^3/ 321 m^3.	Nonhaz (other): Included in sanitary/Included in sanitary.	Nonhaz (other): Included in liquid sanitary/73 m^3.	Nonhaz (other): Included in sanitary/Included in sanitary.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Intersite Transportation of Fissile Materials							
No material would be transported, so no transportation risks would be incurred.	No material would be transported, so no transportation risks would be incurred.	No material would be transported, so no transportation risks would be incurred.	No material would be transported, so no transportation risks would be incurred.	No material would be transported, so no transportation risks would be incurred.	No material would be transported, so no transportation risks would be incurred.	No material would be transported, so no transportation risks would be incurred.	No material would be transported, so no transportation risks would be incurred.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
No Action							
Environmental Justice							
No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	Impacts would not disproportionately affect minority or low-income populations.	Only under unusual conditions would low-income and minority population have the potential to be disproportionately affected by an accidental release.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Land Resources - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	Land area requirements for *Modify Existing Zone 12* would be 0.18 ha during construction, of which 0.1 ha would be used during operation. However, the facility would be situated on previously disturbed land. A buffer zone is established between the facility and the site boundary.	*This subalternative does not apply to ORR.*	Land area requirements for *Modify Actinide Packaging and Storage Facility* would be within an existing previously disturbed protected area. The entire protected area would be required during operation. A buffer zone is provided between the facility and the site boundary.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Land Resources - Upgrade Without RFETS Pu or LANL Pu Subalternative							
Modify Existing FMEF and *Construct New 200 West Area* would be constructed in a previously disturbed protected area with no new land disturbance. During operation the protected area of 6.25 ha/10.5 ha, respectively, would be required. A buffer zone is provided between the facility and the site boundary.	*This subalternative does not apply to NTS.*	*Modify Existing and Construct New ANL-W* would be situated on previously disturbed land and would not create any newly disturbed land area outside the protected area during construction. The protected area of approximately 9 ha would be required during operation. A buffer zone is provided between the facility and the site boundary.	Land area requirements for *Modify Existing Zone 12* would be 0.18 ha during construction, of which 0.1 ha would be used during operation. However, the facility would be situated on previously disturbed land. A buffer zone is established between the facility and the site boundary.	*Modify Existing Y–12 Plant* would utilize existing facilities with no modifications of the exterior of the facility. Land area would not be disturbed nor would additional land be required. A buffer zone is provided between the facility and the site boundary.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Land Resources - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
Modify Existing FMEF and *Construct New 200 West Area* would be constructed in a previously disturbed protected area with no new land disturbance. During operation the protected area of 6.25 ha and 10.5 ha, respectively, would be required. A buffer zone is provided between the facility and the site boundary.	*This subalternative does not apply to NTS.*	*Modify Existing and Construct New ANL-W* would be situated on previously disturbed land and would not create any newly disturbed land area outside the protected area during construction. The protected area of approximately 9 ha would be required during operation. A buffer zone is provided between the facility and the site boundary.	Land area requirements for *Modify Existing Zone 12* would be 0.18 ha during construction, of which 0.1 ha would be used during operation. However, the facility would be situated on previously disturbed land. A buffer zone is established between the facility and the site boundary.	*This subalternative does not apply to ORR.*	Land area requirements for *Modify Actinide Packaging and Storage Facility* would be within an existing previously disturbed protected area. The entire protected area would be required during operation. A buffer zone is provided between the facility and the site boundary.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Land Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts would be the same as all the previous subalternatives, except less land area would be required because the size of the facilities would be smaller.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Site Infrastructure - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	Construction and operation of the *Modify Existing Zone 12* would not affect site infrastructure. Only electrical energy usage would increase over no action. Operation would increase site infrastructure needs above current site availability as follows: EE: 0 MWh/yr PEL: 0 MWe Oil: 0 l/yr Gas: 0 m^3/yr Coal: 0 t/yr.	*This subalternative does not apply to ORR.*	Construction of the *Modify Actinide Packaging and Storage Facility* would not affect site infrastructure. Operation effects would be minimal and would increase site infrastructure needs above current site availability as follows: EE: 0 MWh/yr PEL: 0 MWe Oil: 0 l/yr Gas: 0 m^3/yr Coal: 290 t/yr.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Site Infrastructure - Upgrade Without RFETS or LANL Pu Subalternative							
Modify Existing FMEF/Construct New 200 West Area would not affect site infrastructure. Operations impacts for *Modify Existing FMEF/Construct New 200 West Area* would be minimal and within site availability. Site infrastructure needs would increase above current site availability as follows:	*This subalternative does not apply to NTS.*	Construction of *Modify Existing and Construct New ANL-W* would not affect site infrastructure. Operation would increase site infrastructure needs above current site availability as follows:	Construction and operation of the *Modify Existing Zone 12* would not affect site infrastructure. Only electrical energy usage would increase over no action. Operation would increase site infrastructure needs above current site availability as follows:	There would be no affect on site infrastructure for *Modify Existing Y–12 Plant* during construction. Operational impact for *Modify Existing Y–12 Plant* would increase site infrastructure needs above current site availability as follows:	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
EE: 0/0 MWh/yr		EE: 0 MWh/yr	EE: 0 MWh/yr	EE: 0 MWh/yr			
PEL: 0/0 MWe		PEL: 0 MWe	PEL: 0 MWe	PEL: 0 MWe			
Oil: 0/0 l/yr		Oil: 0 l/yr	Oil: 0 l/yr	Oil: 0 l/yr			
Gas: 0/0 m^3/yr		Gas: 0 m^3/yr	Gas: 0 m^3/yr.	Gas: 0 m^3/yr			
Coal: 0/0 t/yr.		Coal: 0 t/yr.	Coal: 0 t/yr.	Coal: 160 t/yr.			

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Site Infrastructure - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
Modify Existing FMEF/Construct New 200 West Area would not impact site infrastructure. Operations impacts for *Modify Existing FMEF/Construct New 200 West Area* would be minimal and within site availability. Site infrastructure needs would increase above current site availability as follows:	*This subalternative does not apply to NTS.*	During construction of the *Modify Existing and Construct New ANL-W* no affect to site infrastructure would occur. Operation would increase site infrastructure needs above current site availability as follows:	During construction of the *Modify Existing Zone 12* no impacts to site infrastructure would occur. Operation would increase site infrastructure needs above current site availability as follows:	*This subalternative does not apply to ORR.*	Construction of the *Modify Actinide Packaging and Storage Facility* would not affect site infrastructure. Operation effects would be minimal and would increase site infrastructure needs above current site availability as follows:	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
EE: 0/0 MWh/yr		EE: 0 MWh/yr	EE: 0 MWh/y		EE: 0 MWh/yr		
PEL: 0/0 MWe		PEL: 0 MWe	PEL: 0 MWe		PEL: 0 MWe		
Oil: 0/0 l/yr		Oil: 0 l/yr	Oil: 0 l/yr		Oil: 0 l/yr		
Gas: 0/0 m^3/yr		Gas: 0 m^3/yr	Gas: 0 m^3/yr		Gas: 0 m^3/yr		
Coal: 0/0 t/yr.		Coal: 0 t/yr.	Coal: 0 t/yr.		Coal: 400 t/yr.		
Site Infrastructure - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Site infrastructure would be able to accommodate this subalternative. There would be a reduction in the use of electrical energy because electric usage is dependent on the amount of material used.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Water Resources - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during construction would be 0/0.	*This subalternative does not apply to ORR.*	The total percent increase in surface water use/discharge for *Modify Actinide Packaging and Storage Facility* during construction would be 0/0.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
			The total percent increase in groundwater use/discharge for *Modify Existing Zone 12* during construction would be 2.6/2.2.		The total percent increase in groundwater use/discharge for *Modify Actinide Packaging and Storage Facility* during construction would be 0.02/0.2.		
			The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during operation would be 0/0.		The total percent increase in surface water use/discharge for *Modify Actinide Packaging and Storage Facility* during operation would be 0/0.		
			The total percent increase in groundwater use/discharge for *Modify Existing Zone 12* during operation would be 11/9.1.		The total percent increase in groundwater use/discharge for *Modify Actinide Packaging and Storage Facility* during operation would be 0.04/0.2.		

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Water Resources - Upgrade Without RFETS Pu or LANL Pu Subalternative							
The total percent increase in surface water use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during construction would be 0/0 and 0.04/1.6, respectively.	*This subalternative does not apply to NTS.*	The total percent increase in surface water use/discharge for *Modify Existing and Construct New ANL-W* during construction would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during construction would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Y–12 Plant* during construction would be 0.02/0.1.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
The total percent increase in groundwater use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during construction would be 2.6/1.6 and 0/0, respectively.		The total percent increase in groundwater use/discharge for *Modify Existing and Construct New ANL-W* during construction would be 0.1/0.7.	The total percent increase in groundwater use/discharge for *Modify Existing Zone 12* during construction would be 2.6/2.2.	The total percent increase in groundwater use/discharge for *Modify Existing Y–12 Plant* during construction would be 0/0.			
The total percent increase in surface water use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during operation would be 0/0 and 0.06/0, respectively.		The total percent increase in surface water use/discharge for *Modify Existing and Construct New ANL-W* during operation would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during operation would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Y–12 Plant* during operation would be $2.0 \times 10^{-3}/9.0 \times 10^{-5}$.			
The total percent increase in groundwater use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during operation would be 4.3/0 and 0/0.		The total percent increase in groundwater use/discharge for *Modify Existing and Construct New ANL-W* during operation would be 0.2/0.	The total percent increase in groundwater use/discharge for *Modify Existing Zone 12* during operation would be 11/9.1.	The total percent increase in groundwater use/discharge for *Modify Existing Y–12 Plant* during operation would be 0/0.			

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Water Resources - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
The total percent increase in surface water use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during construction would be 0/0 and 0.06/0.04, respectively.	*This subalternative does not apply to NTS.*	The total percent increase in surface water use/discharge for *Modify Existing and Construct New ANL-W* during construction would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during construction would be 0/0.	*This subalternative does not apply to ORR.*	The total percent increase in surface water use/discharge for *Modify Actinide Packaging and Storage Facility* during construction would be 0/0.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
The total percent increase in groundwater use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during construction would be 4.0/3.0 and 0/0, respectively.		The total percent increase in groundwater use/discharge for *Modify Existing and Construct New ANL-W* during construction would be 0.2/1.1.	The total percent increase in groundwater use/discharge for *Modify Existing Zone 12* during construction would be 32.1/5.7.		The total percent increase in groundwater use/discharge for *Modify Actinide Packaging and Storage Facility* during construction would be 0.02/0.3.		
The total percent increase in surface water use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during operation would be 0/0 and 0.07/0, respectively.		The total percent increase in surface water use/discharge for *Modify Existing and Construct New ANL-W* during operation would be 0/0.	The total percent increase in surface water use/discharge for *Modify Existing Zone 12* during operation would be 0/0.		The total percent increase in surface water use/discharge for *Modify Actinide Packaging and Storage Facility* during operation would be 0/0.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Water Resources - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative (continued)							
The total percent increase in groundwater use/discharge for *Modify Existing FMEF* and *Construct New 200 West Area* during operation would be 4.6/0 and 0/0, respectively.	*This subalternative does not apply to NTS.*	The total percent increase in groundwater use/discharge for *Modify Existing and Construct New ANL-W* during operation would be 0.3/0.	The total percent increase in groundwater use/discharge for *Modify Existing Zone 12* during operation would be 44.2/0.	*This subalternative does not apply to ORR.*	The total percent increase in groundwater use/discharge for *Modify Actinide Packaging and Storage Facility* during operation would be 0.05/0.3.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Water Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts for construction and operation would be slightly less than the other subalternatives.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Biological Resources - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing Zone 12 Facility.*	*This subalternative does not apply to ORR.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Actinide Packaging and Storage Facility.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Biological Resources - Upgrade Without RFETS Pu or LANL Pu Subalternative							
Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing FMEF* and *Construct New 200 West Area.*	*This subalternative does not apply to NTS.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing and Construct New ANL-W.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing Zone 12 Facility.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing Y–12 Plant.*	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Biological Resources - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing FMEF* and *Construct New 200 West Area.*	*This subalternative does not apply to NTS.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing and Construct New ANL-W.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Existing Zone 12 Facility.*	*This subalternative does not apply to ORR.*	Construction and operation would have minimal impact on biological resources due to use of disturbed areas of the site for *Modify Actinide Packaging and Storage Facility.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Biological Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts would have same effects as the other subalternative because the size of the facilities would be similar.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Cultural and Paleontological Resources - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	It is unlikely that NRHP-eligible prehistoric and historic resources exist within the previously disturbed 0.18 ha of land area for the *Modify Existing Zone 12.* Operation would not result in additional impact. Some Native American resources would be affected by construction and operation of the *Modify Existing Zone 12.* Some Paleontological resources would be affected by the construction and operation of the *Modify Existing Zone 12.*	*This subalternative does not apply to ORR.*	Some NRHP-eligible prehistoric and historic resources may exist within the construction area for *Modify Actinide Packaging and Storage Facility.* Operation would not result in additional impact. Some Native American resources may be affected by construction and operation of the *Modify Actinide Packaging and Storage Facility.* SRS does not contain scientifically valuable paleontological remains.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Cultural and Paleontological Resources - Upgrade Without RFETS Pu or LANL Pu Subalternative							
No impact would occur as a result of *Modify Existing FMEF.* Some NRHP-eligible prehistoric and historic resources may exist within the previously disturbed construction area (10.5 ha) for the *New 200 West Area Facility.* Operation would not result in additional impact.	*This subalternative does not apply to NTS.*	It is unlikely that NRHP-eligible prehistoric and historic resources exist within the construction area for the *Modify Existing and Construct New ANL-W.* Operation would not result in additional impact.	It is unlikely that NRHP-eligible prehistoric and historic resources exist within the previously disturbed 0.18 ha of land area for the *Modify Existing Zone 12.* Operation would not result in additional impact.	Building modifications are proposed for four NRHP-eligible resources for *Modify Existing Y–12 Plant.*	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
No impact would occur as a result of *Modify Existing FMEF.* Some Native American resources may be affected by construction and operation of the *New 200 West Area Facility.*		Some Native American resources may be affected by construction and operation for *Modify Existing and Construct New ANL-W.*	Some Native American resources would be affected by construction and operation of the *Modify Existing Zone 12.*	It is unlikely that Native American resources would be affected by construction or operation for *Modify Existing Y–12 Plant.*			
No impact would occur as a result of *Modify Existing FMEF.* Some paleontological resources may be affected by construction of the *New 200 West Area Facility.*		Paleontological resources may be affected by construction of the *Modify Existing and Construct New ANL-W.*	Some Paleontological resources would be affected by the construction and operation of the *Modify Existing Zone 12.*	No activity is planned that would affect paleontological resources for *Modify Existing Y–12 Plant.*			

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Cultural and Paleontological Resources - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
No impact would occur as a result of *Modify Existing FMEF*. Some NRHP-eligible prehistoric and historic resources may exist within the previously disturbed construction area (10.5 ha) for construction of the *New 200 West Area Facility*. Operation would not result in additional impact.	*This subalternative does not apply to NTS.*	It is unlikely that NRHP-eligible prehistoric and historic resources exist within the construction area for the *Modify Existing and Construct New ANL-W*. Operation would not result in additional impact.	It is unlikely that NRHP-eligible prehistoric and historic resources exist within the previously disturbed 0.18 ha of land area for the *Modify Existing Zone 12*. Operation would not result in additional impact.	*This subalternative does not apply to ORR.*	Some NRHP-eligible prehistoric and historic resources may exist within the construction area for *Modify Actinide Packaging and Storage Facility*. Operation would not result in additional impact.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
No impact would occur as a result of *Modify Existing FMEF*. Some Native American resources may be affected by construction and operation of the *New 200 West Area Facility*.		Some Native American resources may be affected by construction and operation for *Modify Existing and Construct New ANL-W*.	Some Native American resources would be affected by construction and operation of the *Modify Existing Zone 12*.		Some Native American resources may be affected by construction and operation of the *Modify Actinide Packaging and Storage Facility*.		
No impact would occur as a result of *Modify Existing FMEF*. Some paleontological resources may be affected by construction of the *New 200 West Area Facility*.		Paleontological resources may be affected by construction for the *Modify Existing and Construct New ANL-W*.	Some Paleontological resources would be affected by the construction and operation of the *Modify Existing Zone 12*.		SRS does not contain scientifically valuable paleontological remains.		

Cultural and Paleontological Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative

Impacts would be similar to those for the other subalternatives because the amount of land disturbed would be the same.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Socioeconomics - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	During peak construction/operation total employment would increase by much less than 1 percent/ less than 1 percent over No Action.	*This subalternative does not apply to ORR.*	During peak construction/operation total employment would increase by much less than 1 percent/much less than 1 percent over No Action.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
			Local transportation would change from free flow to a restricted condition during construction. Local transportation would not change appreciably during operation.		Local transportation would change from a restricted condition to a further restricted condition during construction. Local transportation would not be affected during operation.		
Socioeconomics - Upgrade Without RFETS Pu or LANL Pu Subalternative							
During peak construction/operation total employment would increase by much less than 1 percent/much less than 1 percent over No Action.	*This subalternative does not apply to NTS.*	During peak construction/operation total employment would increase by much less than 1 percent/much less than 1 percent over No Action.	During peak construction/operation total employment would increase by much less than 1 percent/ less than 1 percent over No Action.	During peak construction/operation total employment would increase by much less than 1 percent/much less than 1 percent over No Action.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Local transportation would not change appreciably.		Local transportation would change from free flow to a restricted condition during construction. Operation would not have an effect.	Local transportation would change from free flow to a restricted condition during construction. Local transportation would not change appreciably during operation.	Local transportation would not change appreciably.			

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Socioeconomics - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
During peak construction/operation total employment would increase by much less than 1 percent/much less than 1 percent over No Action.	*This subalternative does not apply to NTS.*	During peak construction/operation total employment would increase by much less than 1 percent/much less than 1 percent over No Action.	During peak construction/operation total employment would increase by much less than 1 percent/ less than 1 percent over No Action.	*This subalternative does not apply to ORR.*	During peak construction/operation total employment would increase by much less than 1 percent/much less than 1 percent over No Action.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Local transportation would not change appreciably.		Local transportation would change from free flow to a restricted condition during construction. Operation would not have an effect.	Local transportation would change from free flow to a restricted condition during construction. Local transportation would not change appreciably during operation.		Local transportation would change from a restricted condition to a further restricted condition during construction. Local transportation would not be affected during operation.		
Socioeconomics - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
There would be a small reduction in total employment during construction and operation.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
Normal Radiological Impacts							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	The annual dose from the *Modify Existing Zone 12 Storage Facility* to the MEI of the public would be $<1.8x10^{-8}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $<4.5x10^{-13}$ from 50 years of operation.	*This subalternative does not apply to ORR.*	The annual dose from the *Modify Actinide Packaging and Storage Facility* to the MEI of the public would be $6.8x10^{-6}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $1.7x10^{-10}$ from 50 years of operation.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
			The annual dose from the *Modify Existing Zone 12 Storage Facility* to the public within 80 km would be $<6.3x10^{-6}$ person-rem. The estimated number of fatal cancers to the public is $<1.6x10^{-7}$ from 50 years of operation.		The annual dose from the *Modify Actinide Packaging and Storage Facility* to the public within 80 km would be $2.9x10^{-4}$ person-rem. The estimated number of fatal cancers to the public is $7.2x10^{-6}$ from 50 years of operation.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative (continued)							
Normal Radiological Impacts (continued)							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	The average annual dose from the *Modify Existing Zone 12 Storage Facility* to the involved worker would be 116 mrem. The estimated fatal cancer risk for the average involved worker would be 2.3×10^{-3} from 50 years of operation.	*This subalternative does not apply to ORR.*	The average annual dose from the *Modify Actinide Packaging and Storage Facility* to the involved worker would be 250 mrem. The estimated fatal cancer risk for the average involved worker would be 5.0×10^{-3} from 50 years of operation.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
			The annual total dose from the *Modify Existing Zone 12 Storage Facility* to the involved workforce would be 3 person-rem, which would result in an estimated 0.06 fatal cancer from 50 years of operation.		The annual dose from the *Modify Actinide Packaging and Storage Facility* to the total involved workforce would be 7.5 person-rem, which would result in an estimated 0.15 fatal cancer from 50 years of operation.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative (continued)							
Hazardous Chemical Impacts							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	The HI and cancer risk for the public for *Modify Existing Zone 12* would be 0 and 0, respectively.	*This subalternative does not apply to ORR.*	The HI and cancer risk for the public for *Modify Actinide Packaging and Storage Facility* would be 1.5×10^{-6} and 0, respectively.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
			The HI and cancer risk for the worker for *Modify Existing Zone 12* would be 0 and 0, respectively.		The HI and cancer risk for the worker for *Modify Actinide Packaging and Storage Facility* would be 2.1×10^{-4} and 0, respectively.		

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
				Upgrade Alternative			
Public and Occupational Health and Safety - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative (continued)							
Facility Accidents							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	Based on the estimated maximum impacts from a set of accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing Zone 12*, the probability of cancer/risk to worker would be $7.2x10^{-6}/1.4x10^{-5}$.	*This subalternative does not apply to ORR.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Actinide Packaging and Storage Facility*, the probability of cancer/risk to worker would be $1.2x10^{-5}/2.9x10^{-6}$.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
			Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing Zone 12*, the probability of cancer/risk to the MEI would be $2.9x10^{-6}/5.8x10^{-6}$.		Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Actinide Packaging and Storage Facility*, the probability of cancer/risk to the MEI would be $2.9x10^{-7}/7.0x10^{-8}$.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade with RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative (continued)							
Facility Accidents (continued)							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing Zone 12* would be: Population: Cancer fatalities: $4.4x10^{-4}$ Cancer fatalities risk: $8.8x10^{-4}$.	*This subalternative does not apply to ORR.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Actinide Packaging and Storage Facility* would be: Population: Cancer fatalities: $1.4x10^{-3}$ Cancer fatalities risk: $3.4x10^{-4}$.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade Without RFETS Pu or LANL Pu Subalternative							
Normal Radiological Impacts							
The annual dose from the *Modify Existing FMEF* and *Construct New 200 West Area Storage Facility* to the MEI of the public would be 1.8×10^{-6} mrem. The estimated fatal cancer risk for the MEI of the public from 50 years of operation would be 4.5×10^{-11}.	*This subalternative does not apply to NTS.*	The annual dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the MEI of the public would be 5.1×10^{-7} mrem. The estimated fatal cancer risk for the MEI of the public would be 1.3×10^{-11} from 50 years of operation.	The annual dose from the *Modify Existing Zone 12 Storage Facility* to the MEI of the public would be $<1.8\times10^{-8}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $<4.5\times10^{-13}$ from 50 years of operation.	The annual dose from the *Modify Existing Y–12 Plant Storage Facility* to the MEI of the public would be 2.2×10^{-7} mrem. The estimated fatal cancer risk for the MEI of the public would be 5.5×10^{-12} from 50 years of operation.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
The annual dose from the *Modify Existing FMEF* and *Construct New 200 West Area Storage Facility* to the public within 80 km would be 4.7×10^{-5} person-rem. The estimated number of fatal cancers to the public is 1.2×10^{-6} from 50 years of operation.		The annual dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the public within 80 km would be 3.2×10^{-6} person-rem. The estimated number of fatal cancers to the public is 7.2×10^{-8} from 50 years of operation.	The annual dose from the *Modify Existing Zone 12 Storage Facility* to the public within 80 km would be $<6.3\times10^{-6}$ person-rem. The estimated number of fatal cancers to the public is $<1.6\times10^{-7}$ from 50 years of operation.	The annual dose from the *Modify Existing Y–12 Plant Storage Facility* to the public within 80 km would be 3.4×10^{-6} person-rem. The estimated number of fatal cancers to the public is 8.5×10^{-8} from 50 years of operation.			

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade Without RFETS Pu or LANL Pu Subalternative (continued)							
Normal Radiological Impacts (continued)							
The average annual dose from the *Modify Existing FMEF* and *Construct New 200 West Area Storage Facility* to the involved worker would be 250 mrem. The estimated fatal cancer risk for the average involved worker would be $5.0x10^{-3}$ from 50 years of operation.	*This subalternative does not apply to NTS.*	The average annual dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the involved worker would be 405 mrem. The estimated fatal cancer risk for the average involved worker would be $8.1x10^{-3}$ from 50 years of operation.	The average annual dose from the *Modify Existing Zone 12 Storage Facility* to the involved worker would be 116 mrem. The estimated fatal cancer risk for the average involved worker would be $2.3x10^{-3}$ from 50 years of operation.	The average annual dose from the *Modify Existing Y–12 Plant Storage Facility* to the involved worker would be 28 mrem. The estimated fatal cancer risk for the average involved worker would be $5.6x10^{-4}$ from 50 years of operation.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The annual total dose from the upgraded storage facility to the involved workforce would be 52 person-rem, which would result in an estimated 1.0 fatal cancer from 50 years of operation.		The annual total dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the involved workforce would be 18 person-rem, which would result in an estimated 0.36 fatal cancer from 50 years of operation.	The annual total dose from the *Modify Existing Zone 12 Storage Facility* to the involved workforce would be 3 person-rem, which would result in an estimated 0.06 fatal cancer from 50 years of operation.	The annual total dose from the *Modify Existing Y–12 Plant Storage Facility* to the involved workforce would be 3 person-rem, which would result in an estimated 0.060 fatal cancer from 50 years of operation.			

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade Without RFETS Pu or LANL Pu Subalternative (continued)							
Hazardous Chemical Impacts							
The HI and cancer risk for the public for *Modify Existing FMEF* and *Construct New 200 West Area* would be $9.4x10^{-7}$ and 0, respectively.	*This subalternative does not apply to NTS.*	The HI and cancer risk for the public/worker for *Modify Existing and Construct New ANL-W* would be $1.2x10^{-5}$ and $5.9x10^{-8}$, respectively.	The HI and cancer risk for the public for *Modify Existing Zone 12* would be 0 and 0, respectively.	The HI and cancer risk for the public for *Modify Existing Y–12 Plant* would be $8.6x10^{-5}$ and 0, respectively.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
The HI and cancer risk for the worker for *Modify Existing FMEF* and *Construct New 200 West Area* would be $1.9x10^{-5}$ and 0, respectively.		The HI and cancer risk for the worker for *Modify Existing and Construct New ANL-W* would be $3.7x10^{-4}$ and $1.2x10^{-5}$, respectively.	The HI and cancer risk for the worker for *Modify Existing Zone 12* would be 0 and 0, respectively.	The HI and cancer risk for the worker for *Modify Existing Y–12 Plant* would be $5.7x10^{-4}$ and 0, respectively.			

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade Without RFETS Pu or LANL Pu Subalternative (continued)							
Facility Accidents							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing FMEF* and *Construct New 200 West Area*, the probability of cancer/risk to worker would be $1.8\times10^{-5}/5.7\times10^{-6}$.	*This subalternative does not apply to NTS.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing and Construct New ANL-W*, the probability of cancer/risk to worker would be $2.3\times10^{-5}/7.5\times10^{-5}$.	Based on the estimated maximum impacts from a set of accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing Zone 12*, the probability of cancer/risk to worker would be $7.2\times10^{-6}/1.4\times10^{-5}$.	Based on the estimated maximum impacts from a set of accidents analyzed for environmental assessment analyses, the maximum impacts and annual risks for *Modify Existing Y–12 Plant*, would be reduced approximately 80 percent for the expected risk, resulting in a latent cancer fatality risk of 5.7×10^{-8} to worker.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing FMEF* and *Construct New 200 West Area*, the probability of cancer/risk to MEI would be $1.8\times10^{-7}/5.7\times10^{-8}$.		Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing and Construct New ANL-W*, the probability of cancer/risk to MEI would be $1.6\times10^{-6}/5.0\times10^{-6}$.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing Zone 12*, the probability of cancer/risk to MEI would be $2.9\times10^{-6}/5.8\times10^{-6}$.	Based on the estimated maximum impacts from a set of potential accidents analyzed for environmental assessment analyses, the maximum impacts and annual risks for *Modify Existing Y–12 Plant*, would be reduced approximately 80 percent for the expected risk, of 5.1×10^{-7} to the MEI.			

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade Without RFETS Pu or LANL Pu Subalternative (continued)							
Facility Accidents (continued)							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing FMEF* and *Construct New 200 West Area* would be:	*This subalternative does not apply to NTS.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing and Construct New ANL-W* would be:	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing Zone 12* would be:	Based on the estimated maximum impacts from a set of potential accidents analyzed for environmental assessment analyses, the maximum impacts and annual risks for *Modify Existing Y–12 Plant* would be reduced approximately 80 percent from the expected risk, resulting in a latent cancer fatality risk of 7.4×10^{-6} to population.	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Population: Cancer fatalities: 1.3×10^{-5} Cancer fatalities risk: 4.2×10^{-4}.		Population: Cancer fatalities: 5.1×10^{-4} Cancer fatalities risk: 1.6×10^{-3}.	Population: Cancer fatalities: 4.4×10^{-4} Cancer fatalities risk: 8.8×10^{-4}.				

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative (continued)							
Normal Radiological Impacts							
The annual dose from the *Modify Existing FMEF* and *Construct New 200 West Area Storage Facility* to the MEI of the public would be $1.8x10^{-6}$ mrem. The estimated fatal cancer risk for the MEI of the public from 50 years of operation would be $4.5x10^{-11}$.	*This subalternative does not apply to NTS.*	The annual dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the MEI of the public would be $5.1x10^{-7}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $1.3x10^{-11}$ from 50 years of operation.	The annual dose from the *Modify Existing Zone 12 Storage Facility* to the MEI of the public would be<$1.8x10^{-8}$ mrem. The estimated fatal cancer risk for the MEI of the public would be <$4.5x10^{-13}$ from 50 years of operation.	*This subalternative does not apply to ORR.*	The annual dose from the *Modify Actinide Packaging and Storage Facility* to the MEI of the public would be $6.8x10^{-6}$ mrem. The estimated fatal cancer risk for the MEI of the public would be $1.7x10^{-10}$ from 50 years of operation.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
The annual dose from the *Modify Existing FMEF* and *Construct New 200 West Area Storage Facility* to the public within 80 km would be $4.7x10^{-5}$ person-rem. The estimated number of fatal cancers to the public is $1.2x10^{-6}$ from 50 years of operation.		The annual dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the public within 80 km would be $3.2x10^{-6}$ person-rem. The estimated number of fatal cancers to the public is $7.2x10^{-8}$ from 50 years of operation.	The annual dose from the *Modify Existing Zone 12 Storage Facility* to the public within 80 km would be <$6.3x10^{-6}$ person-rem. The estimated number of fatal cancers to the public is <$1.6x10^{-7}$ from 50 years of operation.		The annual dose from the *Modify Actinide Packaging and Storage Facility* to the public within 80 km would be $2.9x10^{-4}$ person-rem. The estimated number of fatal cancers to the public is $7.2x10^{-6}$ from 50 years of operation.		

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative (continued)							
Normal Radiological Impacts (continued)							
The average annual dose from the *Modify Existing FMEF* and *Construct New 200 West Area Storage Facility* to the involved worker would be 250 mrem. The estimated fatal cancer risk for the average involved worker would be $5.0x10^{-3}$ from 50 years of operation.	*This subalternative does not apply to NTS.*	The average annual dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the involved worker would be 405 mrem. The estimated fatal cancer risk for the average involved worker would be $8.1x10^{-3}$ from 50 years of operation.	The average annual dose from the *Modify Existing Zone 12 Storage Facility* to the involved worker would be 116 mrem. The estimated fatal cancer risk for the average involved worker would be $2.3x10^{-3}$ from 50 years of operation.	*This subalternative does not apply to ORR.*	The average annual dose from the *Modify Actinide Packaging and Storage Facility* to the involved worker would be 250 mrem. The estimated fatal cancer risk for the average involved worker would be $5.0x10^{-3}$ from 50 years of operation.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
The annual total dose from the upgraded storage facility to the involved workforce would be 52 person-rem, which would result in an estimated 1.0 fatal cancer from 50 years of operation.		The annual total dose from the *Modify Existing and Construct New ANL-W Storage Facility* to the involved workforce would be 18 person-rem, which would result in an estimated 0.36 fatal cancer from 50 years of operation.	The annual total dose from the *Modify Existing Zone 12 Storage Facility* to the involved workforce would be 6 person-rem, which would result in an estimated 0.12 fatal cancer from 50 years of operation.		The annual total dose from the *Modify Actinide Packaging and Storage Facility* to the involved workforce would be 7.5 person-rem, which would result in an estimated 0.15 fatal cancer from 50 years of operation.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative (continued)							
Hazardous Chemical Impacts							
The HI and cancer risk for the public for *Modify Existing FMEF* and *Construct New 200 West Area* would be 9.4×10^{-7} and 0, respectively.	*This subalternative does not apply to NTS.*	The HI and cancer risk for the public/worker for *Modify Existing and Construct New ANL-W* would be 1.2×10^{-5} and 5.9×10^{-8}, respectively.	The HI and cancer risk for the public for *Modify Existing Zone 12* would be 0 and 0, respectively.	*This subalternative does not apply to ORR.*	The HI and cancer risk for the public for *Modify Actinide Packaging and Storage Facility* would be 1.6×10^{-6} and 0, respectively.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
The HI and cancer risk for the worker for *Modify Existing FMEF* and *Construct New 200 West Area* would be 1.9×10^{-5} and 0, respectively.		The HI and cancer risk for the worker for *Modify Existing and Construct New ANL-W* would be 3.7×10^{-4} and 1.2×10^{-5}, respectively.	The HI and cancer risk for the worker for *Modify Existing Zone 12* would be 0 and 0, respectively.		The HI and cancer risk for the worker for *Modify Actinide Packaging and Storage Facility* would be 2.2×10^{-4} and 0, respectively.		

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative (continued)							
Facility Accidents							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing FMEF* and *Construct New 200 West Area*, the probability of cancer/risk to worker would be $1.8x10^{-5}/5.9x10^{-6}$.	*This subalternative does not apply to NTS.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing and Construct New ANL-W*, the probability of cancer/risk to worker would be $1.7x10^{-5}/5.6x10^{-6}$.	Based on the estimated maximum impacts from a set of accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Existing Zone 12*, the probability of cancer/risk to worker would be $1.0x10^{-5}/3.2x10^{-5}$.	*This subalternative does not apply to ORR.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point for *Modify Actinide Packaging and Storage Facility*, the probability of cancer/risk to worker would be $1.2x10^{-5}/3.9x10^{-6}$.	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing FMEF* and *Construct New 200 West Area*, the probability of cancer/risk to MEI would be $1.8x10^{-7}/5.9x10^{-8}$.		Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing and Construct New ANL-W*, the probability of cancer/risk to MEI would be $1.8x10^{-7}/5.9x10^{-8}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Existing Zone 12*, the probability of cancer/risk to MEI would be $4.0x10^{-6}/1.3x10^{-5}$.		Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary for *Modify Actinide Packaging and Storage Facility*, the probability of cancer/risk to MEI would be $2.9x10^{-7}/9.5x10^{-8}$.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Public and Occupational Health and Safety - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative (continued)							
Facility Accidents (continued)							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing FMEF* and *Construct New 200 West Area* would be:	*This subalternative does not apply to NTS.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing and Construct New ANL-W* would be:	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Existing Zone 12* would be:	*This subalternative does not apply to ORR.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for *Modify Actinide Packaging and Storage Facility* would be:	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
Population: Cancer fatalities: 1.3×10^{-3} Cancer fatalities risk: 4.3×10^{-4}.		Population: Cancer fatalities: 3.9×10^{-4} Cancer fatalities risk: 1.3×10^{-4}.	Population: Cancer fatalities: 5.7×10^{-4} Cancer fatalities risk: 1.8×10^{-3}.		Population: Cancer fatalities: 1.4×10^{-3} Cancer fatalities risk: 4.6×10^{-4}.		
Public and Occupational Health and Safety - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
The decrease in the incremental impacts to workers and the population for total site operations from the accident-free storage facility would occur in proportion to the decrease in amount of material. The risk due to accidents would also decrease.							

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Waste Management - Upgrade With RFETS Pu (Pits to Pantex, Non-Pit Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply to Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply to INEL.*	The annual net increase in generation due to *Modify Existing Zone 12 South* for liquid/solid would be as follows:	*This subalternative does not apply to ORR.*	The net annual increase or decrease in generation due to *Modify Actinide Packaging and Storage Facility* for liquid/solid would be as follows:	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
			TRU: 0 m^3/0.8 m^3		TRU: 0 m^3/0 m^3		
			Mixed TRU: 0 m^3/ 0 m^3		Mixed TRU: 0 m^3/ 0 m^3		
			LLW: 0.08 m^3/ 138 m^3		LLW: 0 m^3/ 0 m^3		
			Mixed LLW: 0.2 m^3/ 8 m^3		Mixed LLW: 0 m^3/ 0 m^3		
			HAZ: 1 m^3/1.5 m^3		HAZ: 0 m^3/ 0.56 m^3		
			Nonhaz (sanitary): 12,900 m^3/275 m^3		Nonhaz (sanitary): 1,490 m^3/13 m^3		
			Nonhaz (other): Included in sanitary/344 m^3.		Nonhaz (other): Included in sanitary/13 m^3.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Waste Management - Upgrade Without RFETS Pu or LANL Pu Subalternative							
The annual net increase in generation due to *Modify Existing FMEF* and *Construct New 200 West Area* for liquid/solid would be as follows:	*This subalternative does not apply to NTS.*	The annual net increase in generation due to *Modify Existing and Construct New ANL-W* for liquid/solid would be as follows:	The annual net increase in generation due to *Modify Existing Zone 12 South* for liquid/solid would be as follows:	The annual net increase in generation due to *Modify Existing Y–12 Plant* for liquid/solid would be as follows:	*This subalternative does not apply to SRS.*	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
TRU: 0 m^3/20 m^3		TRU: 0.004 m^3/2 m^3	TRU: 0 m^3/0.8 m^3	TRU: 0 m^3/0 m^3			
Mixed TRU: 0 m^3/ 0 m^3		Mixed TRU: 0 m^3/ 1 m^3	Mixed TRU: 0 m^3/ 0 m^3	Mixed TRU: 0 m^3/ 0 m^3			
LLW: 0.08 m^3/ 85 m^3		LLW: 0.79 m^3/500m^3	LLW: 0.08 m^3/ 138 m^3	LLW: 0.04 m^3/ 3 m^3			
Mixed LLW: 0 m^3/ 5 m^3		Mixed LLW: 0.015 m^3/27 m^3	Mixed LLW: 0.2 m^3/ 8 m^3	Mixed LLW: 0.02 m^3/0.8 m^3			
HAZ: 0.57 m^3/4 m^3		HAZ: 0.15 m^3/1 m^3	HAZ: 1 m^3/1.5 m^3	HAZ: Included in Mixed LLW/ Included in Mixed LLW			
Nonhaz (sanitary): 8,330 m^3/917 m^3		Nonhaz (sanitary): 7,600 m^3/240 m^3	Nonhaz (sanitary): 12,900 m^3/275 m^3	Nonhaz (sanitary): 0.8 m^3/31 m^3			
Nonhaz (other): Included in sanitary/0 m^3.		Nonhaz (other): Included in sanitary/310 m^3.	Nonhaz (other): Included in sanitary/344 m^3.	Nonhaz (other): 0.8 m^3/0.8 m^3.			

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Waste Management - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
The net annual increase in generation due to *Modify Existing FMEF* and *Construct New 200 West Area* for liquid/solid would be as follows:	*This subalternative does not apply to NTS.*	The net annual increase in generation due to *Modify Existing and Construct New ANL-W* for liquid/solid would be as follows:	The net annual increase in generation due to *Modify Existing Zone 12 South* for liquid/solid would be as follows:	*This subalternative does not apply to ORR.*	The net annual increase/decrease in generation due to *Modify Actinide Packaging and Storage Facility* for liquid/solid would be as follows:	*This subalternative does not apply to RFETS.*	*This subalternative does not apply to LANL.*
TRU: 0 m^3/21 m^3		TRU: 0.004 m^3/2 m^3	TRU: 0.02 m^3/10 m^3		TRU: 0 m^3/0 m^3		
Mixed TRU: 0 m^3/ 0 m^3		Mixed TRU: 0 m^3/ 1 m^3	Mixed TRU: 0 m^3/ 4 m^3		Mixed TRU: 0 m^3/ 0 m^3		
LLW: 0.08 m^3/89 m^3		LLW: 0.79 m^3/ 500 m^3	LLW: 2 m^3/ 1,260 m^3		LLW: 0 m^3/ 0 m^3		
Mixed LLW: 0 m^3/ 5 m^3		Mixed LLW: 0.14 m^3/27 m^3	Mixed LLW: 0.2 m^3/ 65 m^3		Mixed LLW: 0 m^3/ 0 m^3		
HAZ: 0.57 m^3/4 m^3		HAZ: 1.3 m^3/ 1 m^3	HAZ: 2 m^3/2 m^3		HAZ: 0 m^3/ 0.8 m^3		
Nonhaz (sanitary): 8,780 m^3/967 m^3		Nonhaz (sanitary): 10,300 m^3/346 m^3	Nonhaz (sanitary): 109,500 m^3/ 1,560 m^3		Nonhaz (sanitary): 1,806 m^3/18 m^3		
Nonhaz (other): Included in sanitary/0 m^3.		Nonhaz (other): Included in sanitary/440 m^3.	Nonhaz (other): Included in sanitary/1,900 m^3.		Nonhaz (other): Included in sanitary/18 m^3.		
Waste Management - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
The volume of operational waste would decrease in proportion to the amount of material excluded.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Intersite Transportation of Fissile Materials- Upgrade with RFETS Pu (Pits to Pantex, Non-Pits Materials to SRS) Subalternative - Preferred Alternative							
This subalternative does not apply at Hanford.	*This subalternative does not apply to NTS.*	*This subalternative does not apply at INEL.*	Transport of RFETS Pu pits to Pantex would have maximum potential fatalities of $6.4x10^{-3}$.	*This subalternative does not apply at ORR.*	Transport of all non-pit materials to SRS would have maximum potential fatalities of 0.06.	The risk associated with transport of RFETS materials would be 0.067.	*This subalternative does not apply at LANL.*
Intersite Transportation of Fissile Materials - Upgrade Without RFETS Pu or LANL Pu Subalternative							
There would be no material transported, therefore the maximum potential fatalities would be 0.	There would be no material transported, therefore the maximum potential fatalities would be 0.	There would be no material transported, therefore the maximum potential fatalities would be 0.	There would be no material transported, therefore the maximum potential fatalities would be 0.	There would be no material transported, therefore the maximum potential fatalities would be 0.	There would be no material transported, therefore the maximum potential fatalities would be 0.	There would be no material transported, therefore the maximum potential fatalities would be 0.	There would be no material transported, therefore the maximum potential fatalities would be 0.
Intersite Transportation of Fissile Materials - Upgrade With All or Some RFETS Pu and LANL Pu Subalternative							
Transport of all materials to Hanford would have maximum potential fatalities of 0.05.	*This subalternative does not apply to NTS.*	Transport of all materials to INEL would have maximum potential fatalities of 0.03.	Transport of all materials to Pantex would have maximum potential fatalities of 0.03.	HEU would continue to be stored, and no additional material would be transported.	Transport of all materials to SRS would have maximum potential fatalities of 0.09.	Transport of all materials from RFETS would have maximum potential fatalities of 0.09.	Transport of all materials from LANL would have maximum potential fatalities of 0.09.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Upgrade Alternative							
Environmental Justice							
No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	*This alternative does not apply to NTS.*	No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	No high or adverse impacts from normal operations or accidents that would disproportionately impact minority or low-income populations.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Land Resources							
New Pu Storage Facility would require 58.5 ha of land area during construction, of which 56 ha would be used during operation. A portion of the facility site is previously disturbed land. A buffer zone would be provided between the facility and the site boundary.	*Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel/New Pu Storage Facility* would disturb 29 ha/58.5 ha of land area during construction, of which 27 ha/56 ha would be used during operation. A buffer zone would be provided between the facility and the site boundary. However, use of P-Tunnel for storage could impact weapons effects testing.	*New Pu Storage Facility* would disturb 58.5 ha of land during construction, of which 56 ha would be used during operation. A buffer zone would be provided between the facility and the site boundary.	*Construct New and Modify Existing Zone 12 South Facilities/New Pu Storage Facility* would not cause new land disturbance during construction or operation. During construction, 60.5 ha/58.5 ha of land area would be required of which 58 ha/56 ha would be used during operation. A buffer zone would be provided between the facility and the site boundary.	*This alternative does not apply to ORR.*	*New Pu Storage Facility* would disturb 58.5 ha during construction, of which 56 ha would be used during operation. A buffer zone would be provided between the facility and the site boundary.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The alternative would be consistent with the current VRM Class 5 designation.	The subalternatives would be consistent with the current VRM Class 5 designation.	The alternative would be consistent with the current VRM Class 5 designation.	The subalternatives would be consistent with the current VRM Class 5 designation.		The alternative would change the current VRM Class 4 designation to Class 5.		

Land Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative

Impacts would be the same as all the previous subalternatives, except less land area would be required because the size of the facilities would be smaller.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Site Infrastructure							
Minimal impacts from *Construct New Pu Storage Facility* would occur. Site infrastructure would be capable of supporting operations without major modifications. Operation would increase site infrastructure above current site availability as follows:	*Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel* and *Construct New Pu Storage Facility* would not impact site infrastructure during construction. Natural gas would be most affected during operation. Operation would increase site infrastructure above current site availability as follows:	*Construct New Pu Storage Facility* requirements would constitute a small change in site resource requirements. Site infrastructure would be capable of supporting operations without major modifications. Operation impacts would increase site infrastructure above current site availability as follows:	Construction and operations of the *Construct New and Modify Existing Zone 12 Facilities/New Pu Storage Facility* would not affect site infrastructure during construction. Electrical energy would have the highest percentage increase over No Action but would not exceed available site resources. Operation impacts would increase site infrastructure above current site availability as follows:	*This alternative does not apply to ORR.*	Construction would not impact site infrastructure for *Construct New Pu Storage Facility*. Operation impacts would be minimal and would increase site infrastructure above current site availability as follows:	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
EE: 0 MWh/yr	EE: 20,096 and 0 MWh/yr	EE: 0 MWh/yr	EE: 0/0 MWh/yr		EE: 0 MWh/yr		
PEL: 0 MWe	PEL: 0 and 0 MWe	PEL: 0 MWe	PEL: 0/0 MWe		PEL: 0 MWe		
Oil: 0 l/yr	Oil: 38,000 and 38,000 l/yr	Oil: 0 l/yr	Oil: 0/0 l/yr		Oil: 46,000 l/yr		
Gas: 0 m^3/yr	Gas: 3,200,000 and 2,800,000 m^3/yr	Gas: 0 m^3/yr	Gas: 0/0 m^3/yr		Gas: 0 m^3/yr		
Coal: 0 t/yr.	Coal: 0 and 0 t/yr.	Coal: 11,000 t/yr.	Coal: 0/0 t/yr.		Coal: 4,200 t/yr.		
Site Infrastructure - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Site infrastructure would be able to accommodate this subalternative. There would be a reduction in the use of electrical energy because electric usage is dependent on the amount of material used.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Water Resources							
The total percent increase in surface water use/discharge during construction for *Construct New Pu Storage Facility* would be 0.6/3.1.	The total percent increase in surface water use/discharge for *Modify Existing Tunnel Drifts and Construct New Material Handling Building P-Tunnel* and *New Pu Storage Facility* during construction would be 0/0 and 0/0.	The total percent increase in surface water use for *New Pu Storage Facility* during construction would be 0. Discharge would be recycled.	The total percent increase in surface water use/discharge for *Construct New and Modify Existing Zone 12 Facilities* and *New Pu Storage Facility* during construction would be 0/0 and 0/0.	*This alternative does not apply to ORR.*	The total percent increase in surface water use for *New Pu Storage Facility* during construction would be 0. Discharge would be recycled.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The total percent increase in groundwater use/discharge during construction for *Construct New Pu Storage Facility* would be 0/0.	The total percent increase in groundwater use/discharge for *Modifying P-Tunnel* and *New Pu Storage Facility* during construction would be 1.5/9.5 and 3.5/9.5.	The total percent increase in groundwater use/discharge for *New Pu Storage Facility* during construction would be 1.1/1.4.	The total percent increase in groundwater use/discharge for *Construct New and Modify Existing Zone 12 Facilities* and *New Pu Storage Facility* during construction would be 32.1/5.7 and 34.1/5.7.		The total percent increase in groundwater use/discharge for *New Pu Storage Facility* during construction would be 0.6/1.1.		
The total percent increase in surface water use/discharge during operation for *Construct New Pu Storage Facility* would be 0.8/0.	The total percent increase in surface water use/discharge during operation for *Modifying P-Tunnel* and *New Pu Storage Facility* would be 0/0 and 0/0.	The total percent increase in surface water use during operation for *New Pu Storage Facility* would be 0. Discharge would be recycled.	The total percent increase in surface water use/discharge during operation for *Construct New and Modify Existing Zone 12 Facilities* and *New Pu Storage Facility* would be 0/0 and 0/0.		The total percent increase in surface water use during operation for *New Pu Storage Facility* would be 0. No surface water would be used. Discharge would be recycled.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Water Resources (continued)							
The total percent increase in groundwater use/discharge during operation for *Construct New Pu Storage Facility* would be 0/0.	The total percent increase in groundwater use/discharge for *Modifying P-Tunnel* and *New Pu Storage Facility* during operation would be 5.4/0 and 4.6/0.	The total percent increase in groundwater use/discharge for *New Pu Storage Facility* during operation would be 0.9/0.	The total percent increase in groundwater use/discharge for *Construct New and Modify Existing Zone 12 Facilities* and *New Pu Storage Facility* during operation would be 44.2/0 and 39.4/0.	*This alternative does not apply to ORR.*	The total percent increase in groundwater use/discharge for *New Pu Storage Facility* during operation would be 2.7/24.1.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Water Resources (continued) - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts for construction and operation would be slightly less than the other subalternatives.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Biological Resources							
Construction and operation of *New Pu Storage Facility* would disturb 58.5 ha of terrestrial sagebrush habitat. Construction would affect animal populations.	Construction and operation of *Modify Existing P-Tunnel/New Pu Storage Facility* would disturb 0 ha/58.5 ha of terrestrial habitat. Construction would affect animal populations. However, *Modify Existing P-Tunnel* would have minimal impact because construction would take place on disturbed area.	Construction and operation of the *New Pu Storage Facility* would disturb 58.5 ha of terrestrial habitat. Construction would affect animal populations.	Construction and operation of the *New and Modify Existing Zone 12 South* and *New Pu Storage Facility* would have minimal impact on biological resources due to use of disturbed areas of the site.	*This alternative does not apply to ORR.*	Construction and operation *New Pu Storage Facility* would disturb 58.5 ha of terrestrial habitat. Construction would affect animal populations.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Construction and operation would not affect wetlands and aquatic resources.	Construction and operation of both options would not affect wetland and aquatic resources.	Construction and operation would not affect wetlands and aquatic resources.	Construction-related ground disturbance may increase the potential for sediment runoff to playa wetlands and aquatic habitat.		During construction and operation there would be minimal effect on wetlands and aquatic resources.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Biological Resources (continued)							
Federal-listed threatened and endangered species would not be affected. A number of State-listed and candidate species could lose nesting/breeding and foraging habitat.	Construction and operation of the *Modify Existing P-Tunnel* would have minimal effect on threatened and endangered species since the habitat is already disturbed. For the *New Pu Storage Facility*, the desert tortoise is the only Federal-listed species that could be affected during construction and operation. Any candidate plant species could be affected during land clearing activities.	Federal-listed threatened and endangered species would not be affected. Several State-status species may lose breeding and foraging habitat. One State-listed sensitive plant species could be potentially affected by construction.	Impacts to threatened and endangered species are not expected.	*This alternative does not apply to ORR.*	Federal-listed threatened and endangered species would not be affected. Several special status species could be affected by construction due to land clearing activities or habitat changes.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Biological Resources (continued) - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts would have same effects as the other subalternative because the size of the facilities would be similar.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Cultural and Paleontological Resources							
No NRHP-eligible prehistoric and historic resources occur within the 58.5 ha that would be disturbed for *Construct New Pu Storage Facility* during construction. Operation would not result in additional impact.	Some NRHP-eligible prehistoric and historic resources may occur within the 29 ha/58.5 ha that would be disturbed during construction of *Modify Existing P-Tunnel/New Pu Storage Facility*. Operation would not result in additional impact.	It is unlikely that NRHP-eligible prehistoric and historic resources occur within the 58.5 ha that would be disturbed during construction of *New Pu Storage Facility*. Operation would not result in additional impact.	Impacts to prehistoric or historic resources are not anticipated within the construction area of the *Construct New and Modify Existing Zone 12* and *New Pu Storage Facility*. Operation would not result in additional impact.	*This alternative does not apply to ORR.*	Some prehistoric and historic resources may occur within the 58.5 ha that would be disturbed during construction of *New Pu Storage Facility*. Operation would not result in additional impact.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Some Native American resources may be affected by construction and operation.	Some Native American resources may be affected by construction and operation.	Some Native American resources may be affected by construction and operation.	It is unlikely that Native American resources would be affected by construction and operation.		Some Native American resources may be affected by construction and operation.		
Some paleontological resources may be affected by construction.	Some paleontological resources may be affected by construction.	Some paleontological resources may be affected by construction.	Intact paleontological resources probably do not occur within the project area.		SRS does not contain scientifically valuable paleontological remains.		

Cultural and Paleontological Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative

Impacts would be similar to those for the other subalternatives because the amount of land disturbed would be the same.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Socioeconomics							
During peak construction/operation of the *New Pu Storage Facility* employment would increase less than 1 percent/less than 1 percent over No Action.	During peak construction/operation of the *Modify Existing P-Tunnel* and *New Pu Storage Facility,* employment would increase less than 1 percent/less than 1 percent and much less than 1 percent/much less than 1 percent, respectively, over No Action.	During peak construction/operation of *New Pu Storage Facility* employment would increase slightly more than 1 percent/ approximately 1 percent over No Action.	During peak construction/operation of *New Facility and Modify Existing Building in Zone 12* and *New Pu Storage Facility* employment would increase less than 1 percent/approximately 1 percent and by almost 1 percent/approximately 1 percent over No Action.	*This alternative does not apply to ORR.*	During peak construction/operation of *New Pu Storage Facility* employment would increase less than 1 percent/less than 1 percent over No Action.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Local transportation would not change appreciably.	Local transportation would not change appreciably.	Local transportation would change from free flow to a restricted condition during construction. Operation would not have an effect.	Local transportation would change from free flow to a restricted condition during construction. Local transportation would not change appreciably during operation.		Local transportation would change from a restricted condition to a further restricted condition during construction. Local transportation would not be affected during operation.		
Socioeconomics - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
There would be a small reduction in total employment during construction and operation.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Public and Occupational Health and Safety							
Normal Radiological Impacts							
The annual dose from the *New Pu Storage Facility* to the MEI of the public would be $2.5x10^{-6}$ mrem, and the estimated risk of fatal cancer would be $6.2x10^{-11}$ from 50 years of operation.	The annual dose from the *Modify Existing P-Tunnel/New Pu Storage Facility* to the MEI of the public for the new facility would be $5.6x10^{-6}$ mrem/ $1.3x10^{-6}$ mrem, and the estimated risk of fatal cancer would be $1.4x10^{-10}$/ $3.2x10^{-11}$ from 50 years of operation.	The annual dose from the *New Pu Storage Facility* to the MEI of the public would be $1.6x10^{-6}$ mrem, and the estimated risk of fatal cancer would be $4.0x10^{-11}$ from 50 years of operation.	The annual dose from the *New and Modify Existing Zone 12/New Pu Storage Facility* to the MEI of the public would be $9.5x10^{-6}$ mrem/ $9.5x10^{-6}$ mrem, and the estimated risk of fatal cancer would be $2.4x10^{-10}$/ $2.4x10^{-10}$ from 50 years of operation.	*This alternative does not apply to ORR.*	The annual dose from the *New Pu Storage Facility* to the MEI of the public would be $1.4x10^{-5}$ mrem, and the estimated risk of fatal cancer would be $3.5x10^{-10}$ from 50 years of operation.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The annual total dose from the *New Pu Storage Facility* to the public within 80 km would be $1.1x10^{-4}$ person-rem. This would result in an estimated $2.8x10^{-6}$ fatal cancer from 50 years of operation.	The annual total dose from the *Modify Existing P-Tunnel/New Pu Storage Facility* to the public within 80 km for the new facility would be $1.7x10^{-6}$/$2.6x10^{-6}$ person-rem. This would result in an estimated $4.3x10^{-8}$/$6.5x10^{-8}$ fatal cancer from 50 years of operation.	The annual total dose from the *New Pu Storage Facility* to the public within 80 km would be $1.8x10^{-5}$ person-rem. This would result in an estimated $4.5x10^{-7}$ fatal cancer from 50 years of operation.	For the new facility the annual total dose from the *New and Modify Existing Zone 12/ New Pu Storage Facility* to the within 80 km public would be $5.5x10^{-5}$/$5.2x10^{-5}$ person-rem. This would result in an estimated $1.4x10^{-6}$/$1.3x10^{-6}$ fatal cancer from 50 years of operation.		The annual total dose from the *New Pu Storage Facility* to the public within 80 km would be $9.2x10^{-4}$ person-rem. This would result in an estimated $2.3x10^{-5}$ fatal cancer from 50 years of operation.		

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Public and Occupational Health and Safety (continued)							
Normal Radiological Impacts (continued)							
The average annual dose from the *New Pu Storage Facility* to the involved worker would be 258 mrem. The estimated fatal cancer risk for the average involved worker would be $5.2x10^{-3}$ from 50 years of operation.	The average annual dose from the *Modify Existing P-Tunnel/New Pu Storage Facility* to the involved worker would be 262/258 mrem. The estimated fatal cancer risk for the average involved worker would be $5.2x10^{-3}/5.2x10^{-3}$ from 50 years of operation.	The average annual dose from the *New Pu Storage Facility* to the involved worker would be 258 mrem. The estimated fatal cancer risk for average involved worker would be $5.2x10^{-3}$ from 50 years of operation.	The average annual dose from the *New and Modify Existing Zone 12/ New Pu Storage Facility* to the involved worker would be 254/ 258 mrem. The estimated fatal cancer risk for the average involved worker would be $5.1x10^{-3}/5.2x10^{-3}$ from 50 years of operation.	*This alternative does not apply to ORR.*	The average annual dose from the *New Pu Storage Facility* to the involved worker would be 258 mrem. The estimated fatal cancer risk for the average involved worker would be $5.2x10^{-3}$ from 50 years of operation.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
New Pu Storage Facility would result in an annual dose to the total involved workforce of 24 person-rem, which would result in an estimated 0.48 fatal cancer from 50 years of operation.	*Modify Existing P-Tunnel/New Pu Storage Facility* would result in an annual dose to the total involved workforce of 30/24 person-rem, which would result in an estimated 0.60/0.48 fatal cancer from 50 years of operation.	*New Pu Storage Facility* would result in an annual dose to the total involved workforce of 24 person-rem, which would result in an estimated 0.48 fatal cancer from 50 years of operation.	*New and Modify Existing Zone 12/ New Pu Storage Facility* would result in an annual dose to the total involved workforce of 31/24 person-rem, which would result in an estimated 0.62/0.48 fatal cancer from 50 years of operation.		*New Pu Storage Facility* would result in an annual dose to the total involved workforce of 24 person-rem, which would result in an estimated 0.48 fatal cancer from 50 years of operation.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Public and Occupational Health and Safety (continued)							
Hazardous Chemical Impacts							
The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the public would be $4.0x10^{-6}$ and $2.7x10^{-8}$, respectively.	The HI and cancer risk from *Modify Existing P-Tunnel* for chemical impacts to the public would be $2.5x10^{-6}$ and $4.1x10^{-9}$, respectively.	The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the public would be $4.5x10^{-5}$ and $5.9x10^{-8}$, respectively.	The HI and cancer risk from *New and Modify Existing Zone 12/New Pu Storage Facility* for chemical impacts to the public would be $1.4x10^{-4}$ and $1.5x10^{-7}$, respectively.	*This alternative does not apply to ORR.*	The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the public would be $2.8x10^{-6}$ and $7.5x10^{-9}$, respectively.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the worker would be $2.8x10^{-4}$ and $1.2x10^{-5}$, respectively.	The HI and cancer risk from *Modify Existing P-Tunnel* for chemical impacts to the worker would be $5.1x10^{-4}$ and $6.4x10^{-6}$, respectively.	The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the worker would be $1.3x10^{-3}$ and $1.2x10^{-5}$, respectively.	The HI and cancer risk from *New and Modify Existing Zone 12/New Pu Storage Facility* for chemical impacts to the worker would be $7.0x10^{-4}$ and $6.2x10^{-6}$, respectively.		The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the worker would be $6.0x10^{-4}$ and $1.1x10^{-5}$, respectively.		
	The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the public would be $2.3x10^{-6}$ and $4.1x10^{-9}$, respectively.						
	The HI and cancer risk from *New Pu Storage Facility* for chemical impacts to the worker would be $4.7x10^{-4}$ and $6.4x10^{-6}$, respectively.						

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Public and Occupational Health and Safety (continued)							
Facility Accidents							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point, the probability of cancer/risk to worker for the *New Pu Storage Facility* would be: $1.8x10^{-5}/5.7x10^{-5}$.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point, the probability of cancer/risk to worker for the *Modify Existing P-Tunnel/New Pu Storage Facility* would be: $1.3x10^{-5}/4.0x10^{-5}$ and $1.2x10^{-5}/3.9x10^{-5}$.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point, the probability of cancer/risk to worker for the *New Pu Storage Facility* would be: $1.7x10^{-5}/5.4x10^{-5}$.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point, the probability of cancer/risk to worker for the *New and Modify Existing Zone 12* and *Construct New Pu Storage Facility* would be: $1.0x10^{-5}/3.2x10^{-5}$ and $7.2x10^{-6}/2.3x10^{-5}$.	*This alternative does not apply to ORR.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker 1,000 m from the release point, the probability of cancer/risk to worker for the *New Pu Storage Facility* would be: $1.2x10^{-5}/3.8x10^{-5}$.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Public and Occupational Health and Safety (continued)							
Facility Accidents (continued)							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary, the probability of cancer/risk to worker for the *New Pu Storage Facility* would be: $1.8x10^{-7}/5.7x10^{-7}$.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary, the probability of cancer/risk to worker for the *Modify Existing P-Tunnel /New Pu Storage Facility* would be: $2.2x10^{-6}/6.9x10^{-6}$ and $2.9x10^{-7}/9.1x10^{-7}$.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary, the probability of cancer/risk to worker for the *New Pu Storage Facility* would be: $1.8x10^{-7}/5.8x10^{-7}$.	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary, the probability of cancer/risk to worker for the *New and Modify Existing Zone 12 Facility* and *Construct New Pu Storage Facility* would be: $4.0x10^{-6}/1.3x10^{-5}$ and $2.9x10^{-6}/9.2x10^{-6}$.	*This alternative does not apply to ORR.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the MEI located at the site boundary, the probability of cancer/risk to worker for the *New Pu Storage Facility* would be: $2.9x10^{-7}/9.3x10^{-7}$.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Public and Occupational Health and Safety (continued)							
Facility Accidents (continued)							
Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	*This alternative does not apply to ORR.*	Based on the estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
New Pu Storage Facility Population: Cancer fatalities: 1.3×10^{-3} Cancer fatalities risk: 4.2×10^{-3}.	*Modify Existing P-Tunnel* Population: Cancer fatalities: 1.6×10^{-5} Cancer fatalities risk: 5.1×10^{-5}	*New Pu Storage Facility* Population: Cancer fatalities: 3.9×10^{-4} Cancer fatalities risk: 1.2×10^{-3}.	*New and Modify Existing Zone 12 Facility* Cancer fatalities: 5.7×10^{-4} Cancer fatalities risk: 1.8×10^{-3}		*New Pu Storage Facility* Population: Cancer fatalities: 1.4×10^{-3} Cancer fatalities risk: 4.5×10^{-3}.		
	New Pu Storage Facility Population: Cancer fatalities: 3.0×10^{-5} Cancer fatalities risk: 9.4×10^{-5}.		*Construct New Pu Storage Facility* Population: Cancer fatalities: 4.4×10^{-4} Cancer fatalities risk: 1.4×10^{-3}.				

Public and Occupational Health and Safety (continued)- Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative

The decrease in the incremental impacts to workers and the population for total site operations from the accident-free storage facility would occur in proportion to the decrease in amount of material. The risk due to accidents would also decrease.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Waste Management							
During construction and operation, all categories of waste would be managed at Hanford.	During construction and operation, all categories of waste would be managed at NTS.	During construction and operation, all categories of waste would be managed at INEL.	During construction and operation, all categories of waste would be managed at Pantex.	*This alternative does not apply to ORR.*	During construction and operation, all categories of waste would be managed at SRS.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The net increase in generation due to *New Pu Storage Facility* for liquid/solid would be as follows:	The net increase in generation due to *Modify Existing P-Tunnel* for liquid/solid would be as follows:	The net increase in generation due to *New Pu Storage Facility* for liquid/solid would be as follows:	The net increase in generation due to *New and Modify Existing Zone 12 Facility* for liquid/solid would be as follows:		The net increase or decrease in generation due to *New Pu Storage Facility* for liquid/solid would be as follows:		
TRU: 0.02 m^3/10 m^3	TRU: 0.02 m^3/10 m^3	TRU: 0.02 m^3/10 m^3	TRU: 0.02 m^3/10 m^3		TRU: 0.02 m^3/2 m^3		
Mixed TRU: 0m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3		Mixed TRU: 0 m^3/ 4 m^3		
LLW: 2/1,260 m^3	LLW: 2 m^3/1,260 m^3	LLW: 2 m^3/1,260 m^3	LLW: 2 m^3/1,260 m^3		LLW: 2 m^3/1,220 m^3		
Mixed LLW: 0.2 m^3/ 65 m^3	Mixed LLW: 0.2 m^3/ 65 m^3	Mixed LLW: 0.2 m^3/ 65 m^3	Mixed LLW: 0.2 m^3/ 65 m^3		Mixed TRU: 0.2 m^3/ 65 m^3		
HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3		HAZ: 2 m^3/2 m^3		
Nonhaz (sanitary): 110,000 m^3/ 1,140 m^3	Nonhaz (sanitary): 135,000 m^3/ 1,620 m^3	Nonhaz (sanitary): 65,900 m^3/ 1,320 m^3	Nonhaz (sanitary): 109,500 m^3/ 1,560 m^3.		Nonhaz (sanitary): 149,720 m^3/ -814 m^3		
Nonhaz (other): Included in sanitary/1,400 m^3.	Nonhaz (other): Included in sanitary/2,000 m^3.	Nonhaz (other): Included in sanitary/1,600 m^3.	Nonhaz (other): Included in sanitary/1,900 m^3.		Nonhaz (other): Included in sanitary/1,800 m^3.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Waste Management (continued)							
	The net increase in generation due to *New Pu Storage Facility* for liquid/solid would be as follows: TRU: 0.02 m^3/10 m^3 Mixed TRU: 0 m^3/ 4 m^3 LLW: 2 m^3/1,260 m^3 Mixed LLW: 0.2 m^3/ 65 m^3 HAZ: 2 m^3/2 m^3 Nonhaz (sanitary): 114,000 m^3/ 1,500 m^3 Nonhaz (other): Included in sanitary/1,900 m^3.		The net increase in generation due to *New Pu Storage Facility* for liquid/solid would be as follows: TRU: 0.02 m^3/10 m^3 Mixed TRU: 0 m^3/ 4 m^3 LLW: 2 m^3/1,260 m^3 Mixed TRU: 0.2 m^3/ 65 m^3 HAZ: 2 m^3/2 m^3 Nonhaz (sanitary): 97,800 m^3/ 1,440 m^3 Nonhaz (other): Included in sanitary/1,800 m^3.				
Waste Management (continued) - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
The volume of operational waste would decrease in proportion to the amount of material excluded.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
				Consolidation Alternative			
Intersite Transportation[a]							
Maximum potential fatalities from intersite transportation of Pu to a consolidated (*New Pu Storage Facility*) storage site would be 0.27.	Maximum potential fatalities from intersite transportation of Pu to a consolidated (*Upgrade P-Tunnel*) storage site would be 0.17. Maximum potential fatalities from intersite transportation of Pu to a consolidated (*New Pu Storage Facility*) storage site would be 0.17.	Maximum potential fatalities from intersite transportation of Pu to a consolidated (*New Pu Storage Facility*) storage site would be 0.20.	Maximum potential fatalities from intersite transportation of Pu to a consolidated (*Upgrade Facility*) storage site would be 0.08. Maximum potential fatalities from intersite transportation of Pu to a consolidated (*New Pu Storage Facility*) storage site would be 0.08.	*This alternative does not apply to ORR.*	Maximum potential fatalities from intersite transportation of Pu to a consolidated (*New Pu Storage Facility*) storage site would be 0.35.	The risk associated with transport of RFETS materials would have a range between 0.08 and 0.35.	The risk associated with transport of LANL materials would have a range between 0.08 and 0.35.

[a] Detailed information is provided in the classified Appendix.

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Consolidation Alternative							
Environmental Justice							
No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	*This alternative does not apply to ORR.*	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income population.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populationss.
Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.		Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Land Resources							
New Pu and HEU Storage Facility would disturb 89.5 ha of land area during construction, of which 87 ha would be used during operation. A portion of the facility is on previously disturbed land. A buffer zone would be provided between the facility and the site boundary.	*Modify Existing P-Tunnel/New Pu and HEU Storage Facility* would disturb 29 ha/89.5 ha of land area during construction, of which 27 ha/87 ha would be used during operation. However, use of the P-Tunnel could impact weapons effects testing. A buffer zone would be provided between the facility and the site boundary.	*New Pu and HEU Storage Facility* would disturb 89.5 ha of land area during construction, of which 87 ha would be used during operation. A buffer zone would be provided between the facility and the site boundary.	*New Pu and HEU Storage Facility* would require 89.5 ha of land area during construction, of which 87 ha would be used during operation. No new land disturbance would occur during construction nor would previously disturbed land be used during operation. A buffer zone would be provided between the facility and the site boundary.	*New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant/New Pu Storage Facility and Modify Existing HEU Storage Facility Y–12 Plant/New Pu and HEU Storage Facility* would disturb 58.5 ha/58.5 ha/89.5 ha of land area during construction, of which 56 ha/56 ha/87 ha would be used during operation. A buffer zone would be provided between the facility and the site boundary.	*New Pu and HEU Storage Facility* would disturb 89.5 ha of land area during construction, of which 87 ha would be used during operation. A buffer zone would be provided between the facility and the site boundary.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The alternative would be consistent with the current VRM Class 5 designation.	All options would be consistent with the current VRM Class 5 designation.	The alternative would be consistent with the current VRM Class 5 designation.	The alternative would be consistent with the current VRM Class 5 designation.	All options would change the current VRM Class 4 designation to Class 5, due to a potential visual impact to roadways with high sensitivity levels.	The alternative would change the current VRM Class 4 designation to Class 5.		
Land Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts would be the same as all the previous subalternatives, except less land area would be required because the size of the facilities would be smaller.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Site Infrastructure							
There would be minimal impact from construction of the *New Pu and HEU Storage Facility*. Site infrastructure would be capable of supporting operations without major modifications. Operation impacts would increase site infrastructure above current site availability as follows:	*Modify Existing P-Tunnel/New Pu and HEU Storage Facility* would not impact site infrastructure. Operation impact are in the areas of electrical energy and fuel requirements. Operation impacts would require slight increases in site infrastructure above current site availability as follows:	Construction requirements of the *New Pu and HEU Storage Facility* would constitute a small change in site resource requirements. Site infrastructure would be capable of supporting operation without major modifications. Operation impacts would require slight increases in site infrastructure above current site availability as follows:	Construction of the *New Pu and HEU Storage Facility* would require small increases in available oil resources. During operation all the site infrastructure resources required would be less than site availability. Operation impacts would increase site infrastructure above current site availability as follows:	Construction of *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant/New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant* would not affect site infrastructure. Construction of *New Pu and HEU Storage Facility* would consume approximately 25 percent more resources than constructing the other two options. Some additional coal and oil would be needed during operation of all options. Operation would require slight increases in site infrastructure above current site availability as follows:	Construction of the *New Pu and HEU Storage Facility* would have minimal impact on site infrastructure. Operation impacts would be minimal and would require slight increases in site infrastructure above current site availability as follows:	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
EE: 0 MWh/yr	EE: 37,096/ 13,096 MWh/yr	EE: 0 MWh/yr	EE: 0 MWh/yr	EE: 0/0/0 MWh/yr	EE: 0 MWh/yr		
PEL: 0 MWe	PEL: 0/0 MWe	PEL: 0 MWe	PEL: 0 MWe	PEL: 0/0/0 MWe	PEL: 0 MWe		
Oil: 0 l/yr	Oil: 38,000/ 38,000 l/yr	Oil: 0 l/yr	Oil: 0 l/yr	Oil:11,000/11,000/ 13,000 l/yr	Oil: 47,000 l/yr		
Gas: 0 m^3/yr	Gas: 3,600,000/ 3,200,000 m^3/yr	Gas: 0 m^3/yr	Gas: 0 m^3/yr	Gas: 0/0/0 m^3/yr	Gas: 0 m^3/yr		
Coal: 0 t/yr.	Coal: 0/0 t/yr.	Coal: 14,000 t/yr.	Coal: 0 t/yr.	Coal: 5,500/5,663/ 5,973 t/yr.	Coal: 4,800 t/yr.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Site Infrastructure - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Site infrastructure would be able to accommodate this subalternative. There would be a reduction in the use of electrical energy because electric usage is dependent on the amount of material used.							

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Water Resources							
The total percent increase in surface water use/discharge during construction for *New Pu and HEU Storage Facility* would be 0.8/5.1.	The total percent increase in surface water use/discharge during construction for *Modify Existing P-Tunnel* and *New Pu and HEU Storage Facility* would be 0/0 and 0/0.	The total percent increase in surface water use/discharge during construction for *New Pu and HEU Storage Facility* would be 0/0.	The total percent increase in surface water use/discharge during construction for *New Pu and HEU Storage Facility* would be 0/0.	The total percent increase in surface water use/discharge during construction for *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant, New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant,* and *New Pu and HEU Storage Facility* would be 0.6/0.3, 0.6/0.5, and 0.7/0.6, respectively.	The total percent increase in surface water use/discharge during construction for *New Pu and HEU Storage Facility* would be 0/0.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The total percent increase in groundwater use/discharge during construction for *New Pu and HEU Storage Facility* would be 0/0.	The total percent increase in groundwater use/discharge during construction for *Modify Existing P-Tunnel* and *New Pu and HEU Storage Facility* would be 1.5/10.6 and 4.4/14.4, respectively.	The total percent increase in groundwater use/discharge during construction for *New Pu and HEU Storage Facility* would be 1.4/2.4.	The total percent increase in groundwater use/discharge during construction for *New Pu and HEU Storage Facility* would be 42/8.7.	The total percent increase in groundwater use/discharge during construction for *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant, New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant,* and *New Pu and HEU Storage Facility* would be 0/0, 0/0, and 0/0, respectively.	The total percent increase in groundwater use/discharge during construction for *New Pu and HEU Storage Facility* would be 0.8/1.9.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
				Collocation Alternative			
Water Resources (continued)							
The total percent increase in surface water use/discharge during operation for *New Pu and HEU Storage Facility* would be 1.1/0.	The total percent increase in surface water use/discharge during operation for *Modify Existing P-Tunnel* and *New Pu and HEU Storage Facility* would be 0/0 and 0/0.	The total percent increase in surface water use/discharge during operation for *New Pu and HEU Storage Facility* would be 0/0.	The total percent increase in surface water use/discharge during operation for *New Pu and HEU Storage Facility* would be 0/0.	The total percent increase in surface water use/discharge during operation for *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant, New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant,* and *New Pu and HEU Storage Facility* would be 1.9/6, 1.9/6, and 2.4/7.6, respectively.	The total percent increase in surface water use/discharge during operation for *New Pu and HEU Storage Facility* would be 0/0.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The total percent increase in groundwater use/discharge during operation for *New Pu and HEU Storage Facility* would be 0/0.	The total percent increase in groundwater use/discharge during operation for *Modify Existing P-Tunnel/New Pu and HEU Storage Facility* would be 7.9/0 and 6.3/0.	The total percent increase in groundwater use/discharge during operation for *New Pu and HEU Storage Facility* would be 1.2/0.	The total percent increase in groundwater use/discharge during operation for *New Pu and HEU Storage Facility* would be 52.2/0.	The total percent increase in groundwater use/discharge during operation for *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant, New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant,* and *New Pu and HEU Storage Facility* would be 0/0, 0/0 and 0/0, respectively.	The total percent increase in groundwater use/discharge during operation for *New Pu and HEU Storage Facility* would be 3.5/30.7.		
Water Resources (continued) - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts for construction and operation would be slightly less than the other subalternatives.							

Table 2.5–2. *Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued*

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Biological Resources							
Construction and operation of *New Pu and HEU Storage Facility* would disturb 89.5 ha of terrestrial habitat. Construction would affect animal populations.	Construction and operation of *Modify Existing P-Tunnel/ New Pu and HEU Storage Facility* would disturb 29 ha/89.5 ha of terrestrial habitat. Construction would affect animal populations. However, *Modify Existing P-Tunnel* would have minimal construction impact because it would take place on disturbed areas.	Construction and operation of *New Pu and HEU Storage Facility* would disturb 89.5 ha of terrestrial habitat. Construction would affect animal populations.	Construction and operation of *New Pu and HEU Storage Facility* would have minimal impact on biological resources due to use of disturbed areas of the site.	Construction and operation of *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant/New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant/New Pu and HEU Storage Facility* would disturb 58.5 ha/ 58.5 ha/89.5 ha of terrestrial habitat. Construction would affect animal populations.	Construction and operation of *New Pu and HEU Storage Facility* would disturb 89.5 ha of terrestrial habitat. Construction would affect animal populations.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Construction and operation would have no effect on wetlands and aquatic resources.	Construction and operation of both options would not affect wetland and aquatic resources.	Construction and operation would have no effect on wetlands and aquatic resources.	Construction-related ground disturbance may increase the potential for sediment runoff to wetlands and aquatic habitat.	Direct impacts to wetlands during construction are not anticipated except possibly along East Fork Poplar Creek. Discharges during construction and operation would not affect associated wetlands and aquatic resources. Soil erosion during construction and operation could cause water quality changes.	During construction and operation, there would be minimal effect on wetlands and aquatic resources.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Biological Resources (continued)							
Federal-listed threatened and endangered species would not likely be affected. A number of State-listed and candidate species could lose nesting, breeding, and foraging habitat.	Construction and operation of the *Modify Existing P-Tunnel* would have minimal effect on threatened and endangered species since the habitat is already disturbed. For the *New Pu Storage Facility* option, the desert tortoise is the only Federal-listed species that could be affected during construction and operation. Any candidate plant species could be affected during land clearing activities.	Federal-listed threatened and endangered species would not likely be affected. Several State-status species could lose breeding and foraging habitat. One state-listed sensitive plant species could be potentially affected by construction.	Impacts to threatened and endangered species would not be expected.	Federal-listed threatened and endangered species would not likely be affected. The Tennessee dace (deemed in need of management by the State) could be affected by siltation. A number of State-protected plants could also be impacted by clearing activities.	Federal-listed threatened and endangered species would not likely be affected. Several special status species could be affected by construction due to land clearing activities or habitat changes.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Biological Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts would have same effects as the other subalternative because the size of the facilities would be similar.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Cultural and Paleontological Resources							
No NRHP-eligible prehistoric or historic resources exist within the 89.5 ha that would be disturbed during construction of the *New Pu and HEU Storage Facility.* Operation would not result in additional impact.	Some NRHP-eligible prehistoric and historic resources may exist within the 29 ha/89.5 ha that would be disturbed during construction of the *Modify Existing P-Tunnel/New Pu and HEU Storage Facility.* Operation would not result in additional impact.	It is unlikely that NRHP-eligible prehistoric and historic resources exist within the 89.5 ha that would be disturbed during construction of the *New Pu and HEU Storage Facility.* Operation would not result in additional impact.	Impacts to prehistoric and historic resources are not anticipated within the previously disturbed construction area of the *New Pu and HEU Storage Facility.* Operation would not result in additional impact.	Some NRHP-eligible prehistoric and historic resources may exist within the up to 58.5 ha/58.5 ha/89.5 ha that would be disturbed during construction of the *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant/New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant/New Pu and HEU Storage Facility.* Operation would not result in additional impact.	Some prehistoric and historic resources may exist within the 89.5 ha that would be disturbed during construction of the *New Pu and HEU Storage Facility.* Operation would not result in additional impact.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Some Native American resources may be affected by construction and operation.	Some Native American resources may be affected by construction and operation.	Some Native American resources may be affected by construction and operation.	It is unlikely that Native American resources would be affected by construction and operation.	Some Native American resources may be affected by construction and operation.	Some Native American resources may be affected by construction and operation.		
Some paleontological resources may exist within the land to be disturbed during construction.	Some paleontological resources may exist within the land to be disturbed during construction.	Some paleontological resources may be affected by construction.	Intact paleontological resources probably do not occur within the project area.	ORR does not contain scientifically valuable paleontological remains.	SRS does not contain scientifically valuable paleontological remains.		
Cultural and Paleontological Resources - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
Impacts would be similar to those for the other subalternatives because the amount of land disturbed would be the same.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Socioeconomics							
During peak construction/operation of the *New Pu and HEU Storage Facility* the percent growth in employment would be less than 1 percent/less than 1 percent over No Action.	During peak construction/operation of the *Modify Existing P-Tunnel* and *New Pu and HEU Storage Facility* the percent growth in employment would be less than 1 percent/much less than 1 percent and less than 1 percent/less than 1 percent, respectively, over No Action.	During peak construction/operation of the *New Pu and HEU Storage Facility* the percent growth in employment would be about 2 percent/slightly more than 1 percent over No Action.	During peak construction/operation of the *New Pu and HEU Storage Facility* the percent growth in employment would be 1 percent/1.2 percent over No Action.	During peak construction/operation of the *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant, New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant*, and *New Pu and HEU Storage Facility* the percent growth in employment would be less than 1 percent/less than 1 percent over No Action for all options.	During peak construction/operation of the *New Pu and HEU Storage Facility* the percent growth in employment would be about 1 percent/less than 1 percent over No Action.	*This subalternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Local transportation would not change appreciably.	Local transportation would not change appreciably.	Local transportation would change from free flow to a somewhat restricted condition during construction. Operation would not have an effect.	Local transportation would change from free flow to a somewhat restricted condition during construction. Local transportation would not change appreciably during operation.	Local transportation would not change appreciably.	Local transportation would change from a somewhat restricted condition to a further restricted condition during construction. Local transportation would not change appreciably during operation.		
Socioeconomics - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
There would be a small reduction in total employment during construction and operation.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Public and Occupational Health and Safety							
Normal Radiological Impacts							
The annual dose from the *New Pu and HEU Storage Facility* to the MEI of the public would be 2.5×10^{-6} mrem and the estimated risk of fatal cancer for the MEI of the public would be 6.2×10^{-11} from 50 years of operation.	For the *Modify Existing P-Tunnel/New Pu and HEU Storage Facility* would result in an annual dose of 5.6×10^{-6}/ 1.3×10^{-6} mrem to the MEI of the public and the estimated fatal cancer risk for the MEI of the public would be 1.4×10^{-10}/ 3.2×10^{-11} from 50 years of operation.	The annual dose from the *New Pu and HEU Storage Facility* to the MEI of the public would be 1.6×10^{-6} mrem and the estimated risk of fatal cancer for the MEI of the public would be 4.0×10^{-11} from 50 years of operation.	The annual dose from the *New Pu and HEU Storage Facility* to the MEI of the public would be 9.6×10^{-6} mrem and the estimated risk of fatal cancer for the MEI of the public would be 2.4×10^{-10} from 50 years of operation.	For *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant/New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant/New Pu and HEU Storage Facility*, the annual dose to the MEI of the public would be 4.5×10^{-5}/4.5×10^{-5}/ 4.5×10^{-5} mrem and the estimated risk of fatal cancer for the MEI of the public would be 1.1×10^{-9}/1.1×10^{-9}/ 1.1×10^{-9} from 50 years of operation.	The annual dose from the *New Pu and HEU Storage Facility* to the MEI of the public would be 1.4×10^{-5} mrem and the estimated risk of fatal cancer for the MEI of the public would be 3.5×10^{-10} from 50 years of operation.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Public and Occupational Health and Safety (continued)							
Normal Radiological Impacts (continued)							
The annual total dose from the *New Pu and HEU Storage Facility* to the public within 80 km would be 1.1×10^{-4} person-rem. This would cause an estimated 2.8×10^{-6} fatal cancers from 50 years of operation.	The annual total dose from the *Modify Existing P-Tunnel/New Pu and HEU Storage Facility* to the public within 80 km would be 1.7×10^{-6}/2.6×10^{-6} person-rem for new facility storage. This would cause an estimated 4.3×10^{-8}/6.5×10^{-8} fatal cancers from 50 years of operation.	The annual total dose from the *New Pu and HEU Storage Facility* to the public within 80 km would be 1.8×10^{-5} person-rem. This would cause an estimated 4.5×10^{-7} fatal cancers from 50 years of operation.	The annual total dose from the *New Pu and HEU Storage Facility* to the public within 80 km would be 5.3×10^{-5} person-rem. This would cause an estimated 1.3×10^{-6} fatal cancers from 50 years of operation.	For *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant/New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant/New Pu and HEU Storage Facility*, the annual total dose to the public within 80 km would be 8.7×10^{-4}/8.7×10^{-4}/8.7×10^{-4} person-rem. This would cause an estimated 2.2×10^{-5}/2.2×10^{-5}/2.2×10^{-5} fatal cancers from 50 years of operation.	The annual dose from the *New Pu and HEU Storage Facility* to the public within 80 km would be 8.8×10^{-4} person-rem. This would cause an estimated 2.2×10^{-5} fatal cancers from 50 years of operation.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Public and Occupational Health and Safety (continued)							
Normal Radiological Impacts (continued)							
The average annual dose from the *New Pu and HEU Storage Facility* to the involved worker would be 264 mrem. The estimated fatal cancer risk for the average involved worker would be $5.3x10^{-3}$ from 50 years of operation.	The average annual dose from the *Modify Existing P-Tunnel/New Pu and HEU Storage Facility* to the involved worker for the new facility would be 262/264 mrem. The estimated fatal cancer risk for the average involved worker would be $5.2x10^{-3}$/$5.3x10^{-3}$ from 50 years of operation.	The average annual dose from the *New Pu and HEU Storage Facility* to the involved worker would be 264 mrem. The estimated fatal cancer risk for the average involved worker would be $5.3x10^{-3}$ from 50 years of operation.	The average annual dose from the *New Pu and HEU Storage Facility* to the involved worker would be 264 mrem. The estimated fatal cancer risk for the average involved worker would be $5.3x10^{-3}$ from 50 years of operation.	For *New Pu Storage Facility and Maintain Existing HEU Storage Facility Y–12 Plant/New Pu Storage and Modify Existing HEU Storage Facility Y–12 Plant/New Pu and HEU Storage Facility*, the average annual dose from the collocated storage facility to the involved worker would be 264/264/264 mrem. The estimated fatal cancer risk for the average involved worker would be $5.3x10^{-3}$/$5.3x10^{-3}$/$5.3x10^{-3}$ from 50 years of operation.	The average annual dose from the *New Pu and HEU Storage Facility* to the involved worker would be 264 mrem. The estimated fatal cancer risk for the average involved worker would be $5.3x10^{-3}$ from 50 years of operation.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Public and Occupational Health and Safety (continued)							
Normal Radiological Impacts (continued)							
New Pu and HEU Storage Facility would result in an annual dose to the total involved workforce of 25 person-rem which would result in an estimated 0.50 fatal cancers from 50 years of operation.	*Modify Existing P-Tunnel/New Pu and HEU Storage Facility* would result in an annual dose to the total involved workforce of 40/25 person-rem which would result in an estimated 0.80/0.50 fatal cancers from 50 years of operation.	*New Pu and HEU Storage Facility* would result in an annual dose to the total involved workforce of 25 person-rem which would result in an estimated 0.50 fatal cancers from 50 years of operation.	*New Pu and HEU Storage Facility* would result in an annual dose to the total involved workforce of 25 person-rem which would result in an estimated 0.50 fatal cancers from 50 years of operation.	*New Pu Storage Facility and Maintain Existing Y–12 Plant, New Pu Storage and Modify Existing Y–12 Plant*, and *New Pu and HEU Storage Facility* would result in an annual dose to the total involved workforce of 25 person-rem which would result in an estimated 0.50 fatal cancers from 50 years of operation.	*New Pu and HEU Storage Facility* would result in an annual dose to the total involved workforce of 25 person-rem which would result in an estimated 0.50 fatal cancers from 50 years of operation.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Public and Occupational Health and Safety (continued)							
Hazardous Chemical Impacts							
The HI and cancer risk for *New Pu and HEU Storage Facility* for chemical impacts to the public would be $1.6x10^{-5}$ and $2.7x10^{-8}$, respectively.	The HI and cancer risk for *Modify Existing P-Tunnel Storage Facility* for chemical impacts to the public would be $2.8x10^{-6}$ and $4.1x10^{-9}$, respectively.	For *New Pu and HEU Storage Facility* the HI and cancer risk for chemical impacts to the public would be $7.7x10^{-5}$ and $5.9x10^{-8}$, respectively.	The HI and cancer risk for *New Pu and HEU Storage Facility* for chemical impacts to the public would be $2.0x10^{-4}$ and $1.5x10^{-7}$, respectively.	For all subalternatives the HI and cancer risk for chemical impacts to the public would be $1.5x10^{-4}$ and $1.6x10^{-7}$, respectively.	The HI and cancer risk for *New Pu and HEU Storage Facility* for chemical impacts to the public would be $6.2x10^{-6}$ and $7.5x10^{-9}$, respectively.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The HI and cancer risk for *New Pu and HEU Storage Facility* for chemical impacts to the worker would be $7.1x10^{-4}$ and $1.2x10^{-5}$, respectively.	The HI and cancer risk for *Modify Existing P-Tunnel Storage Facility* for chemical impacts to the worker would be $5.6x10^{-4}$ and $6.4x10^{-6}$, respectively.	For *New Pu and HEU Storage Facility* the HI and cancer risk for chemical impacts to the worker would be $1.9x10^{-3}$ and $1.2x10^{-5}$, respectively.	The HI and cancer risk for *New Pu and HEU Storage Facility* for chemical impacts to the worker would be $9.3x10^{-4}$ and $6.2x10^{-6}$, respectively.	For all subalternatives the HI and cancer risk for chemical impacts to the worker would be $1.3x10^{-3}$ and $1.3x10^{-5}$, respectively.	The HI and cancer risk for *New Pu and HEU Storage Facility* for chemical impacts to the worker would be $1.0x10^{-3}$ and $1.1x10^{-5}$, respectively.		
	For *New Pu and HEU Storage Facility* the HI and cancer risk for chemical impacts to the public would be: $4.2x10^{-6}$ and $4.1x10^{-9}$, respectively.						
	For *New Pu and HEU Storage Facility* the HI and cancer risk for chemical impacts to the worker would be: $7.2x10^{-4}$ and $6.4x10^{-6}$, respectively.						

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
				Collocation Alternative			
Public and Occupational Health and Safety (continued)							
Facility Accidents							
Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to a worker 1,000 m from the release point, the probability of cancer risk to the worker would be: $1.8x10^{-5}/5.7x10^{-5}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to a worker 1,000 m from the release point, the probability of cancer risk to the worker for *P-Tunnel* and *New Pu and HEU Storage Facility* would be: $1.3x10^{-5}/4.0x10^{-5}$ and $1.2x10^{-5}/3.9x10^{-5}$, respectively.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to a worker 1,000 m from the release point, the probability of cancer risk to the worker would be: $1.7x10^{-5}/5.4x10^{-5}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to a worker 1,000 m from the release point, the probability of cancer risk to the worker would be: $7.2x10^{-6}/2.3x10^{-5}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to a worker 619 m from the release point, the probability of cancer risk to the worker for all options would be: $2.5x10^{-5}/7.9x10^{-5}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to a worker 1,000 m from the release point, the probability of cancer risk to the worker would be: $1.2x10^{-5}/3.8x10^{-5}$.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the MEI of the public located at the site boundary, the probability of cancer risk to the MEI of the public would be: $1.8x10^{-7}/5.7x10^{-7}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the MEI of the public located at the site boundary, the probability of cancer risk to the MEI of the public for the *P-Tunnel* and *New Pu and HEU Storage Facility* would be: $2.2x10^{-6}/6.9x10^{-6}$ and $2.9x10^{-7}/9.1x10^{-7}$, respectively.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the MEI of the public located at the site boundary, the probability of cancer risk to the MEI of the public would be: $1.8x10^{-7}/5.8x10^{-7}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the MEI of the public located at the site boundary, the probability of cancer risk to the MEI of the public would be: $2.9x10^{-6}/9.2x10^{-6}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the MEI of the public located at the site boundary, the probability of cancer risk to the MEI of the public for all options would be: $3.1x10^{-5}/9.9x10^{-5}$.	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the MEI of the public located at the site boundary, the probability of cancer risk to the MEI of the public would be: $2.0x10^{-7}/6.3x10^{-7}$.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Public and Occupational Health and Safety (continued)							
Facility Accidents (continued)							
Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks for all options would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive releases to the general population residing within 80 km, the maximum impacts and 50-year facility lifetime risks would be:	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
Population: Cancer fatalities: $1.3x10^{-3}$ Cancer fatalities risk: $4.2x10^{-3}$.	*P-Tunnel* Population: Cancer fatalities: $1.6x10^{-5}$ Cancer fatalities risk: $5.1x10^{-5}$ *New Pu and HEU Storage Facility* Population: Cancer fatalities: $3.0x10^{-5}$ Cancer fatalities risk: $9.4x10^{-5}$.	Population: Cancer fatalities: $3.9x10^{-4}$ Cancer fatalities risk: $1.2x10^{-3}$.	Population: Cancer fatalities: $4.4x10^{-4}$ Cancer fatalities risk: $1.4x10^{-3}$.	Population: Cancer fatalities: $5.3x10^{-3}$ Cancer fatalities risk: $1.7x10^{-2}$.	Population: Cancer fatalities: $1.4x10^{-3}$ Cancer fatalities risk: $4.6x10^{-3}$.		
Public and Occupational Health and Safety - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
The decrease in the incremental impacts to workers and the population for total site operations from the accident-free storage facility would occur in proportion to the decrease in amount of material. The risk due to accidents would also decrease.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Waste Management							
During construction and operation, all categories of waste would be managed at Hanford.	During construction and operation, all categories of waste would be managed at NTS.	During construction and operation, all categories of waste would be managed at INEL.	During construction and operation, all categories of waste would be managed at Pantex except LLW which would be shipped to NTS unless new LLW facilities were built.	During construction and operation, all categories of waste would be managed at ORR.	During construction and operation, all categories of waste would be managed at SRS.	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*
The annual net increase in generation due to collocation for liquid/solid would be as follows:	The increase due to collocation (P-Tunnel) for liquid/solid would be as follows:	The annual net increase in generation due to collocation for liquid/solid would be as follows:	The annual net increase in generation due to collocation for liquid/solid would be as follows:	The annual net increase in generation due to collocation (new Pu facility) liquid/solid would be as follows:	The annual net increase in generation due to upgrade for liquid/solid would be as follows:		
TRU: 0.02 m^3/10 m^3	TRU: 0.02 m^3/10 m^3	TRU: 0.02 m^3/10 m^3	TRU: 0.02 m^3/10 m^3	TRU: 0.02 m^3/10 m^3	TRU:0.02 m^3/2 m^3		
Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 4 m^3		
LLW: 2.1 m^3/ 1,300 m^3	LLW: 2.1 m^3/ 1,300 m^3	LLW: 2.1 m^3/ 1,300 m^3	LLW: 2.1 m^3/ 1,300 m^3	LLW: 2 m^3/1,260 m^3	LLW: 2.1 m^3/ 1,260 m^3		
Mixed LLW: 0.2 m^3/ 66 m^3	Mixed LLW: 0.2 m^3/ 66 m^3	Mixed LLW: 0.2 m^3/ 66 m^3	Mixed LLW: 0.2 m^3/ 66 m^3	Mixed LLW: 0.2 m^3/ 65 m^3	Mixed LLW: 0.2 m^3/ 66 m^3		
HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3	HAZ: 2 m^3/2 m^3		
Nonhaz (sanitary): 146,000 m^3/ 1,760 m^3	Nonhaz (sanitary): 189,000 m^3/ 1,960 m^3	Nonhaz (sanitary): 86,800 m^3/ 1,720 m^3	Nonhaz (sanitary): 129,500 m^3/ 1,840 m^3	Nonhaz (sanitary): 136,630 m^3/ 1,340 m^3	Nonhaz (sanitary): 195,780 m^3/ -414 m^3		
Nonhaz (other): Included in sanitary/2,200 m^3.	Nonhaz (other): Included in sanitary/2,500 m^3.	Nonhaz (other): Included in sanitary/2,100 m^3.	Nonhaz (other): Included in sanitary/2,300 m^3.	Nonhaz (other): Included in sanitary/1,700 m^3.	Nonhaz (other): Included in sanitary/2,300 m^3.		

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Waste Management (continued)							
This option does not apply to Hanford.	The net increase in generation due to *New Pu and HEU Storage Facility* for liquid/solid would be as follows: TRU: 0.02 m^3/10 m^3 Mixed TRU: 0 m^3/ 4 m^3 LLW: 2.1 m^3/ 1,300 m^3 Mixed LLW: 0.2 m^3/ 66 m^3 Haz: 2 m^3/2 m^3 Nonhaz (sanitary): 153,000 m^3/ 1,900 m^3 Nonhaz (other): Included in sanitary/2,400 m^3.	*This option does not apply to INEL.*	*This option does not apply to Pantex.*	The net increase in generation due to collocation (new Pu and upgrade HEU) of waste liquid/solid would be as follows: TRU: 0.02 m^3/10 m^3 Mixed TRU: 0 m^3/ 4 m^3 LLW: 2 m^3/1,263 m^3 Mixed LLW: 0.2 m^3/ 66 m^3 HAZ: 2 m^3/2 m^3 Nonhaz (sanitary): 136,630 m^3/ 1,370 m^3 Nonhaz (other): 0.8 m^3/1,700 m^3 The net increase in generation due to collocation (new Pu and HEU) for liquid/solid would be as follows: TRU: 0.02 m^3/10 m^3 Mixed TRU: 0 m^3/ 4 m^3 LLW: 1.7m^3/ 1,300 m^3 Mixed LLW: -0.2 m^3/ 66 m^3 HAZ: 2 m^3/2 m^3 Nonhaz (sanitary): 171,840 m^3/ 1,720 m^3 Nonhaz (other): -0.4 m^3/2,200 m^3.	*This option does not apply to SRS.*	*This alternative does not apply to RFETS.*	*This alternative does not apply to LANL.*

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Waste Management (continued) - Not Including Strategic Reserve and Weapons Research and Development Materials Subalternative							
The volume of operational waste would decrease in proportion to the amount of material excluded.							

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Intersite Transportation of Fissile Materials							
Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocated (*New Pu and HEU Storage Facility*) storage site would be 1.07.	Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocated (*New Pu and HEU Storage Facility*) storage site would be 0.83	Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocated (*New Pu and HEU Storage Facility*) storage site would be 0.87.	Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocated (*New Pu and HEU Storage Facility*) storage site would be 0.46.	Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocated (*New Pu and HEU Storage Facility*) storage site would be 0.29.	Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocated (*New Pu and HEU Storage Facility*) storage site would be 0.50.	The risk associated with transport of RFETS materials would have a range between 0.29 and 1.07.	The risk associated with transport of LANL materials would have a range between 0.29 and 1.07.
	Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocate (new facility) storage site range from 0 to 0.83.			Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocate (new Pu and upgrade HEU facility) storage site range from 0 to 0.29.			
				Maximum potential fatalities from intersite transportation of Pu and HEU to a consolidated and collocate (new Pu and existing HEU facility) storage site range from 0 to 0.29.			

Table 2.5–2. Summary Comparison of Environmental Impacts for the No Action and Long-Term Storage Alternatives—Continued

Hanford Site	Nevada Test Site	Idaho National Engineering Laboratory	Pantex Plant	Oak Ridge Reservation	Savannah River Site	Rocky Flats Environmental Technology Site	Los Alamos National Laboratory
Collocation Alternative							
Environmental Justice							
No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations		
Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.	Transportation accidents would be random events along transportation corridors; thus, there would not be any disproportionate impacts to minority or low-income populations.

Table 2.5–3

Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)

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Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)

		Deep Borehole			Immobilization	
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*	**Direct Disposition Alternative**	**Immobilized Disposition Alternative**		**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)*[a]	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)*[a]
			Ceramic Immobilization Facility	**Deep Borehole Complex**		
Land Resources						
The facility would disturb 14 ha of land area for construction, of which 12 ha would be used during operation. The operating facility would be located in a 1.6-km (1-mi) buffer zone totaling 1,853 ha.	The facility would disturb 36 ha of land area for construction, of which 28 ha would be used during operation. The operating facility would be located in a 1.6-km (1-mi) buffer zone totaling 1,416 ha.	The facility would disturb 63 ha of land area for construction, of which 57 ha would be used during operation. The operating facility would be located in a 1.6-km (1-mi) buffer zone totaling 2,041 ha.	The facility would disturb 28.3 ha of land area for construction, of which 18.2 ha would be used during operation. The need for buffer zones would be determined during site-specific, tiered NEPA documentation.	The facility would disturb 63 ha of land area for construction, of which 57 ha would be used during operation. The operating facility would be located in a 1.6-km (1-mi) buffer zone totalling 2,041 ha.	The facility would disturb 24 ha of land area for construction, of which 12 ha would be used during operation. The need for buffer zones would be determined during site-specific, tiered NEPA documentation.	The facility would disturb 20 ha of land area for construction, of which 12 ha would be used during operation. The need for buffer zones would be determined during site-specific, tiered NEPA documentation.
The alternative would be consistent with a VRM Class 5 designation.	The alternative would be consistent with a VRM Class 5 designation.	The VRM classification would be determined after the site is selected.	The alternative would be consistent with a VRM Class 5 designation. Construction of the facility could change existing VRM Class 4 designation to Class 5, due to a potential visual impact to roadways with high sensitivity levels.	The VRM classification would be determined after the site is selected.	The alternative would be consistent with a VRM Class 5 designation. Construction of the facility could change existing VRM Class 4 designation to Class 5, due to a potential visual impact to roadways with high sensitivity levels.	The alternative would be consistent with a VRM Class 5 designation. Construction of the facility could change existing VRM 4 designation to Class 5, due to a potential visual impact to roadways with high sensitivity levels.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative- Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
		Land Resources		
No disturbance or additional land area would be required since an existing facility would be used. As an existing facility, a buffer zone is established.	The facility would disturb 121 ha of land area for construction, of which 81 ha would be used during operation. The operating facility would be located in a 1.6-km (1-mi) buffer zone totalling 890 ha.	No disturbance or additional land area would be required due to the existing conditions. As an existing facility, a buffer zone is established.	No disturbance or additional land area would be required since the reactor is partially completed. The buffer zone is established.	Two-unit large or small facility would disturb 284 ha of land area for construction, of which 138 ha would be used during operation. Buffer zones would be established in accordance with applicable NRC regulations.
The alternative would be consistent with a VRM Class 5 designation.	The alternative would be consistent with a VRM Class 5 designation. Construction of the facility could change existing VRM Class 4 designation to Class 5.	The VRM classification of the developed area would likely be Class 5.	The VRM classification would likely be Class 5.	The alternative would be consistent with a VRM Class 5 designation. Construction of the facility could change existing VRM Class 3 and 4 designations to Class 5. Potential visual impact to roadways with high sensitivity levels could occur.

Table 2.5–3. *Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued*

		Deep Borehole			Immobilization	
Pit Disassembly/ Conversion Facility	**Plutonium Conversion Facility**	**Direct Disposition Alternative**	**Immobilized Disposition Alternative**		**Vitrification Alternative**	**Ceramic Immobilization Alternative**
(Preferred Alternative-Hanford, INEL, Pantex, or SRS)	*(Preferred Alternative-Hanford or SRS)*		**Ceramic Immobilization Facility**	**Deep Borehole Complex**	*(Preferred Alternative-Hanford or SRS)*[a]	*(Preferred Alternative-Hanford or SRS)*[a]
Site Infrastructure						
Site infrastructure requirements and increase over site availability are as follows:	Site infrastructure requirements and increase over site availability are as follows:	Site infrastructure requirements and increase over site availability are as follows:	Site infrastructure requirements and increase over site availability are as follows:	Site infrastructure requirements and increase over site availability are as follows:	Site infrastructure requirements and increase over site availability are as follows:	Site infrastructure requirements and increase over site availability are as follows:
Construction	**Construction**	**Construction**	**Construction**	**Construction**	**Construction**	**Construction**
Requirement (annual):	Requirement (annual):	Requirement (annual):	Requirement (annual):	Requirement (annual):	Requirement (annual):	Requirement (annual):
EE: 2,500 MWh	EE: 1,100 MWh	EE: 600 MWh	EE: 10,200 MWh	EE: 567 MWh	EE: 2,000 MWh	EE: 8,000 MWh
PEL: 5 MWe	PEL: <1 MWe		PEL: 2 MWe		PEL: 5 MWe	PEL: 1.5 MWe
Oil: 126,200 l	Oil: 157,850 l	Oil: 2,133,000 l	Oil: 3,000,000 l	Oil: 2,000,000 l	Oil: 94,000 l	Oil: 2,200,000 l
Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3
Range of increase:	Range of increase:	Range of increase:	Range of increase:	Range of increase:	Range of increase:	Range of increase:
EE: 0 MWh	EE: 0 MWh	EE: 0 MWh	EE: 0 MWh	EE: 0 MWh	EE: 0 MWh	EE: 0 MWh
PEL: 0 MWe	PEL: 0 MWe		PEL: 0 MWe	PEL: 0 MWe	PEL: 0 MWe	PEL: 0 MWe
Oil: 0 to 126,200 l	Oil: 0 to 157,850 l	Oil: 0 l	Oil: 0 to 3,000,000 l	Oil: 0 l	Oil: 0 to 94,000 l	Oil: 0 to 2,200,000 l
Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3	Gas: 0 m^3

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
		Site Infrastructure		
Infrastructure requirement and increase over site availability would be as follows:	Infrastructure requirement and increase over site availability would be as follows:	Infrastructure would be minimal since facility exists. Infrastructure requirement over site availability would be as follows:	There would be no impacts to site infrastructure during construction or operation.	Infrastructure requirement and increase over site availability would be as follows:
Construction: Would be minimal.	**Construction:** Requirement (annual): EE: 833 MWh PEL:1 MWe Oil: 126,180 l Gas: 0 m^3 Range of increase: EE: 0 MWh PEL: 0 to 0.5 MWe Oil: 0 to 126,180 l Gas: 0 m^3.	**Construction:** Would have no impact.	**Construction:** Would be minimal.	**Construction (large or small reactor):** Requirement (annual): EE: 20,000 MWh PEL: 20 MWe Oil: 946,000 l Gas: 0 m^3 Range of increase: EE: 0 MWh PEL: 0 to 7 MWe Oil: 0 to 946,000 l Gas: 0 m^3.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

Pit Disassembly/ Conversion Facility *(Preferred Alternative- Hanford, INEL, Pantex, or SRS)*	Plutonium Conversion Facility *(Preferred Alternative- Hanford or SRS)*	Deep Borehole: Direct Disposition Alternative	Deep Borehole: Immobilized Disposition Alternative: Ceramic Immobilization Facility	Deep Borehole: Immobilized Disposition Alternative: Deep Borehole Complex	Immobilization: Vitrification Alternative *(Preferred Alternative- Hanford or SRS)*[a]	Immobilization: Ceramic Immobilization Alternative *(Preferred Alternative- Hanford or SRS)*[a]
Site Infrastructure (continued)						
Operation: Requirement (annual): EE: 20,000 MWh PEL: 5 MWe Oil: 28,000 l Gas: 3,398,000 m^3 Range of Increase: EE: 0 MWh PEL: 0 MWe Oil: 0 to 28,000 l Gas: 0 to 3,398,000 m^3.	**Operation:** Requirement (annual): EE: 21,000 MWh PEL: 5 MWe Oil: 39,750 l Gas: 4,361,000 m^3 Range of Increase: EE: 0 MWh PEL: 0 MWe Oil: 0 to 39,750 l Gas: 0 to 4,361,000 m^3.	**Operation:** Requirement (annual): EE: 6,500 MWh PEL: 2 MWe Oil: 774,400 l Gas: 5,100,000 m^3 Possible Increase: EE: 0 MWh PEL: 0 MWe Oil: 774,100 l Gas: 5,100,000 m^3.	**Operation:** Requirement (annual): EE: 35,000 MWh PEL: 5 MWe Oil: 210,000 l Gas: 3,800,000 m^3 Range of Increase: EE: 0 MWh PEL: 0 MWe Oil: 0 to 210,000 l Gas: 0 to 3,800,000 m^3.	**Operation:** Requirement (annual): EE: 6,100 MWh PEL: 2 MWe Oil: 773,280 l Gas: 4,810,000 m^3 Possible Increase: EE: 0 MWh PEL: 0 MWe Oil: 773,280 l Gas: 4,810,000 m^3.	**Operation:** Requirement (annual): EE: 12,000 MWh PEL: 3 MWe Oil: 378,500 l Gas: 0 m^3 Range of Increase: EE: 0 MWh PEL: 0 MWe Oil: 0 to 378,500 l Gas: 0 m^3.	**Operation:** Requirement (annual): EE: 25,000 MWh PEL: 3 MWe Oil: 190,000 l Gas: 3,500,000 m^3 Range of Increase: EE: 0 MWh PEL: 0 MWe Oil: 0 to 190,000 l Gas: 0 to 3,500,000 m^3.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Site Infrastructure (continued)				
Operation: Requirement (annual): EE: 2,400 MWh PEL: 0.008 MWe Oil: 0 l Gas: 0 m^3 Possible increase: EE: 0 MWh PEL: 0 MWe Oil: 0 l Gas: 0 m^3	**Operation:** Requirement (annual): EE: 13,000 MWh PEL: 5 MWe Oil: 20,000 l Gas: 2,350,000 m^3 Range of increase: EE: 0 MWh PEL: 0 to 4.5 MWe Oil: 0 to 20,000 l Gas: 0 to 2,350,000 m^3	**Operation:** Requirement (annual): EE: 700,000 to 1,100,000 MWh PEL: 96 to 140 MWe Oil: 757,000 l Gas: 0 m^3 Possible increase: EE: 0 MWh PEL: 0 MWe Oil: 0 l Gas: 0 m^3	**Operation:** Requirement (annual): EE: 700,000 to 1,100,000 MWh PEL: 96 to 140 MWe Oil: 757,000 l Gas: 0 m^3 Range of increase: EE: 0 MWh PEL: 0 MWe Oil: 0 l Gas: 0 m^3	**Operation (large reactor):** Requirement (annual): EE: 1,100,000 MWh PEL: 140 MWe Oil: 757,000 l Gas: 0 m^3 Range of increase: EE: 0 to 1,048,096 MWh PEL: 0 to 127 MWe Oil: 0 to 757,000 l Gas: 0 m^3 **Operation (small reactor):** Requirement (annual): EE: 580,000 MWh PEL: 75 MWe Oil: 416,000 l Gas: 0 m^3 Range of increase: EE: 0 to 528,096 MWh PEL: 0 to 62 MWe Oil: 0 to 416,000 l Gas: 0 m^3

Table 2.5–3. *Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued*

		Deep Borehole			Immobilization	
Pit Disassembly/ Conversion Facility	**Plutonium Conversion Facility**	**Direct Disposition Alternative**	**Immobilized Disposition Alternative**		**Vitrification Alternative**	**Ceramic Immobilization Alternative**
(Preferred Alternative- Hanford, INEL, Pantex, or SRS)	*(Preferred Alternative- Hanford or SRS)*		**Ceramic Immobilization Facility**	**Deep Borehole Complex**	*(Preferred Alternative- Hanford or SRS)*[a]	*(Preferred Alternative- Hanford or SRS)*[a]
Air Quality and Noise						
During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.
During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.
No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
		Air Quality and Noise		
During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.	During construction, site is expected to comply with ambient air quality standards and guidelines. However, PM_{10} and TSP concentrations are expected to increase during peak construction period.
During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.	During operation, site is expected to comply with ambient air quality standards and guidelines.
No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.	No appreciable change in offsite noise levels would occur.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			Immobilization	
Pit Disassembly/ Conversion Facility	Plutonium Conversion Facility	Direct Disposition Alternative	Immobilized Disposition Alternative		Vitrification Alternative	Ceramic Immobilization Alternative
			Ceramic Immobilization Facility	Deep Borehole Complex		
(Preferred Alternative-Hanford, INEL, Pantex, or SRS)	*(Preferred Alternative-Hanford or SRS)*				*(Preferred Alternative-Hanford or SRS)*[a]	*(Preferred Alternative-Hanford or SRS)*[a]
Water Resources						
Facility water requirement and discharge during construction would be as follows: 1.9 MLY and 1.9 MLY, respectively.	Facility water requirement and discharge during construction would be as follows: 2.4 MLY and 2.4 MLY, respectively.	Water requirement and wastewater generation from construction for a generic site would be as follows: Surface water (SW) or Groundwater (GW): 15.1 MLY Wastewater (WW): 12.0 MLY, respectively.	Facility water requirement and discharge during construction would be as follows: 38 MLY and 29.6 MLY, respectively.	Water requirement and wastewater generation from construction for a generic site would be as follows: SW or GW: 15.1 MLY WW:12.0 MLY, respectively.	Facility water requirement and discharge during construction would be as follows: 10.6 MLY and 4.6 MLY, respectively.	Facility water requirement and discharge during construction would be as follows: 38 MLY and 28.8 MLY, respectively.
Water requirement and wastewater generation from construction over No Action would be as follows: SW: 0.01 percent GW: 0.01 to 0.8 percent WW: 0.08 to 2.3 percent.	Water requirement and wastewater generation from construction over No Action would be as follows: SW: 0.02 percent GW: 0.02 to 1.0 percent WW: 0.1 to 2.9 percent.		Water requirement and wastewater generation from construction over No Action would be as follows: SW: 0.3 percent GW: 0.3 to 15.2 percent WW: 1.3 to 36.1 percent.		Water requirement and wastewater generation from construction over No Action would be as follows: SW: 0.07 to 0.08 percent GW: 0.08 to 4.3 percent WW: 0.2 to 5.6 percent.	Water requirement and wastewater generation from construction over No Action would be as follows: SW: 0.3 percent GW: 0.3 to 15.3 percent WW: 1.3 to 35.1 percent.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Water Resources				
Facility water requirement/ wastewater generation during construction would be as follows: 15 MLY/0 MLY.	Facility water requirement/ wastewater generation during construction would be as follows: 1.9 MLY/1.9 MLY.	There would be no impacts to water (surface or groundwater) resources or wastewater.	Facility water requirements generation during construction would be as follows: 220 MLY.	Facility water requirement/ wastewater generation during construction would be as follows: Large: 126 MLY/104 MLY Small: 76 MLY/59 MLY
Water requirement and wastewater generation from construction over No Action would be as follows SW: 0 percent GW: 0.02 percent WW: 0 percent.	Water requirement and wastewater generation from construction over No Action would be as follows: SW: 0.01 percent GW: 0.01 to 0.8 percent WW: 0.08 to 2.3 percent.			Water requirement and wastewater generation from construction over No Action would be as follows: Large Reactor: SW: 0.9 percent GW: 1.0 to 50.6 percent WW: 4.5 to 127 percent Small Reactor: SW: 0.5 to 0.6 percent GW: 0.6 to 30.5 percent WW: 2.6 to 72 percent.

Table 2.5–3. *Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued*

		Deep Borehole			Immobilization	
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*	**Direct Disposition Alternative**	**Immobilized Disposition Alternative**		**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)*[a]	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)*[a]
			Ceramic Immobilization Facility	**Deep Borehole Complex**		
Water Resources (continued)						
Facility water requirement and discharge during operation would be 94.6 MLY and 85.2 MLY, respectively.	Facility water requirement and discharge during operation would be 80.5 MLY and 15 MLY, respectively.		Facility water requirement and discharge during operation would be 320 MLY and 123.9 MLY, respectively.		Facility water requirement and discharge during operation would be 250 MLY and 197 MLY, respectively.	Facility water requirement and discharge during construction would be 250 MLY and 98 MLY, respectively.
Water requirement and wastewater generation from operation over No Action would be as follows:	Water requirement and wastewater generation from operations above No Action levels would be as follows:	Water requirement and wastewater generation from operation for a generic site would be as follows:	Water requirement and wastewater generation from operation over No Action would be as follows:	Water requirement and wastewater generation from operation for a generic site would be as follows:	Water requirement and wastewater generation from operation over No Action would be as follows:	Water requirement and wastewater generation from operation over No Action would be as follows:
SW: 0.6 to 0.7 percent	SW: 0.6 percent	SW: 165.4 MLY	SW:2.2 to 2.4 percent	SW:165.4 MLY	SW: 1.7 to 1.9 percent	SW: 1.7 to 1.9 percent
GW: 0.7 to 38.0 percent	GW: 0.6 to 32.3 percent	GW: 165.4 MLY	GW: 2.4 to 129 percent	GW: 165.4 MLY	GW: 1.9 to 100.4 percent	GW: 1.9 to 100 percent
WW: 3.7 to 103.9 percent.	WW: 0.7 to 18.2 percent.	WW: 17.4 MLY.	WW: 5.4 to 151 percent.	WW: 17.4 MLY.	WW: 8.7 to 240 percent.	WW: 4.3 to 119.5 percent.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Water Resources (continued)				
Facility water requirement/ wastewater generation during operation would be as follows: 17.4 MLY/0 MLY.	Facility water requirement/ wastewater generation during operation would be as follows: 56.8 MLY/43.5 MLY.	There would be no impacts to water (surface or groundwater) resources or wastewater.	Facility water requirements during operation would be as follows: 69,084 MLY.	Facility water requirement/ wastewater generation during operation would be as follows: (Wet Site) Large: 60,560 MLY/341 MLY Small: 27,252 MLY/189 MLY (Dry Site) Large: 341 MLY/341 MLY Small: 189.3 MLY/189 MLY
Water requirement and wastewater generation from operation over No Action would be as follows: SW: 0 percent GW: 0.04 percent WW: 0 percent.	Water requirement and wastewater generation from operations above No Action levels would be as follows: SW: 0.4 percent GW: 0.4 to 5.1 percent WW: 1.9 to 53 percent.			Water requirement and wastewater generation from operation over No Action would be as follows: Large Reactor: SW: 47.4 to 448 percent GW: 2.6 to 137 percent WW: 15 to 415.9 percent Small Reactor: SW: 21.3 to 202 percent GW: 1.4 to 75.9 percent WW: 8.3 to 230 percent.

Table 2.5–3. *Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued*

Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	Plutonium Conversion Facility *(Preferred Alternative-Hanford or SRS)*	Deep Borehole: Direct Disposition Alternative	Deep Borehole: Immobilized Disposition Alternative: Ceramic Immobilization Facility	Deep Borehole: Immobilized Disposition Alternative: Deep Borehole Complex	Immobilization: Vitrification Alternative *(Preferred Alternative-Hanford or SRS)*[a]	Immobilization: Ceramic Immobilization Alternative *(Preferred Alternative-Hanford or SRS)*[a]
Biological Resources						
Construction would result in the disturbance of 14 ha of terrestrial habitat and affect animal populations on undisturbed land at Hanford, NTS, and INEL. Construction on previously disturbed developed areas at Pantex, ORR and SRS would result in minimal impact.	Construction would result in the disturbance of 36 ha of terrestrial habitat and affect animal populations on undisturbed land at Hanford, NTS, and INEL. Construction on previously disturbed developed areas at Pantex, ORR and SRS would result in minimal impact.	Construction would result in the disturbance of 63 ha of terrestrial habitat and affect animal populations.	Construction would result in the disturbance of 28.3 ha of terrestrial habitat and affect animal populations on undisturbed land at Hanford, NTS, INEL, and ORR. Construction on previously disturbed developed areas at Pantex and SRS would result in minimal impact.	Construction would result in the disturbance of 63 ha of terrestrial habitat and affect animal populations.	Construction would result in the disturbance of 24 ha of terrestrial habitat and affect animal populations on undisturbed land at Hanford, NTS, INEL, and ORR. Construction on previously disturbed developed areas at Pantex and SRS would result in minimal impact.	Construction would result in the disturbance of 20 ha of terrestrial habitat and affect animal populations on undisturbed land at Hanford, NTS, INEL, and ORR. Construction on previously disturbed developed areas at Pantex and SRS would result in minimal impact.
Wetlands and aquatic resources would not be affected, except for possible minor impacts to playas at Pantex during operation.	Wetlands and aquatic resources would not be affected, except for possible minor impacts to playas at Pantex during construction.	In general, direct impacts to wetlands and aquatic resources from construction and operation would not be expected at dry sites.	Wetlands and aquatic resources would not be affected, except for possible minor impacts to playas at Pantex and site streams at ORR.	In general, direct impacts to wetlands and aquatic resources from construction and operation would not be expected at dry sites.	Wetlands and aquatic resources would not be affected, except for possible minor impacts to playas at Pantex and site streams at ORR.	Wetlands and aquatic resources would not be affected, except for possible minor impacts to playas at Pantex and site streams at ORR.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit) *(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Biological Resources				
There would be no impact to biological resources since existing facilities would be used and no additional disturbance of land area or habitat would occur.	Construction would disturb 121 ha of terrestrial habitat and affect animal populations on undisturbed land at Hanford, NTS, INEL, ORR, and SRS. Construction on previously disturbed/developed area at Pantex would result in minimal impact.	There would be no impacts to biological resources from use of an existing facility.	There would be minimal impact to terrestrial resources during construction and operation since previously disturbed land would be used.	Construction would disturb 284 ha (two-unit large or small) of terrestrial habitat and affected animal populations.
	Wetlands and aquatic resources would not be affected, except for possible minor impacts to playas at Pantex and several site streams.		During operation, wastewater discharges and salt drift from cooling towers could impact wetlands. Construction may impact wetlands and aquatic species from sedimentation of nearby water bodies. Operation would lead to an increase in impingement, entrainment, and thermal impacts to aquatic organisms.	In general, direct impacts to wetlands and aquatic resources from construction and operation would not be expected at dry sites, except for impacts to playas at Pantex. During operation, impacts to several site rivers, streams, and playas are possible, including increased sedimentation, stream bank scouring, and an increase in impingement, entrainment, and thermal impacts.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			Immobilization	
Pit Disassembly/ Conversion Facility	**Plutonium Conversion Facility**	**Direct Disposition Alternative**	**Immobilized Disposition Alternative**		**Vitrification Alternative**	**Ceramic Immobilization Alternative**
(Preferred Alternative-Hanford, INEL, Pantex, or SRS)	*(Preferred Alternative-Hanford or SRS)*		**Ceramic Immobilization Facility**	**Deep Borehole Complex**	*(Preferred Alternative-Hanford or SRS)*[a]	*(Preferred Alternative-Hanford or SRS)*[a]
Biological Resources (continued)						
One Federal-listed threatened species, the desert tortoise, at NTS may be affected during construction and operation.	One Federal-listed threatened species, the desert tortoise, at NTS maybe affected during construction and operation.	Construction and operation would have the potential to affect threatened and endangered species.	One Federal-listed threatened species, the desert tortoise, at NTS may be affected during construction and operation.	Construction and operation would have the potential to affect threatened and endangered species.	One Federal-listed threatened species, the desert tortoise, at NTS may be affected during construction and operation.	One Federal-listed threatened species, the desert tortoise, at NTS may be affected during construction and operation.
Several State-listed and candidate species at several sites could be affected by the disturbance of breeding, nesting, and foraging habitat.	Several State-listed and candidate species at several sites could be affected by the disturbance of breeding, nesting, and foraging habitat.		Several State-listed and candidate species at several sites could be affected by the disturbance of breeding, nesting, and foraging habitat.		Several State-listed and candidate species at several sites could be affected by the disturbance of breeding, nesting, and foraging habitat.	Several State-listed and candidate species at several sites could be affected by the disturbance of breeding, nesting, and foraging habitat.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Biological Resources (continued)				
	One Federal-listed threatened species, the desert tortoise, at NTS may be affected during construction and operation.		Threatened and endangered species are unlikely to be impacted by construction activities. Impacts during operation are possible.	One Federal-listed threatened species, the desert tortoise at NTS, may be affected during construction and operation. The smooth purple coneflower at SRS and bald eagle at Pantex may be affected during construction only.
	Several State-listed and candidate species at several sites could be affected by the disturbance of breeding, nesting, and foraging habitat.			Several Federal candidate and State-listed species could be affected by construction activity or by loss of breeding, nesting, and foraging habitat.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

Pit Disassembly/ Conversion Facility (*Preferred Alternative-Hanford, INEL, Pantex, or SRS*)	Plutonium Conversion Facility (*Preferred Alternative-Hanford or SRS*)	Deep Borehole: Direct Disposition Alternative	Deep Borehole: Immobilized Disposition Alternative: Ceramic Immobilization Facility	Deep Borehole: Immobilized Disposition Alternative: Deep Borehole Complex	Immobilization: Vitrification Alternative (*Preferred Alternative-Hanford or SRS*)[a]	Immobilization: Ceramic Immobilization Alternative (*Preferred Alternative-Hanford or SRS*)[a]
Cultural and Paleontological Resources						
Some NRHP-eligible prehistoric and historic resources may exist within the 14 ha that would be disturbed during construction. Operation would not result in additional impact.	Some NRHP-eligible prehistoric and historic resources may exist within the 36 ha that would be disturbed during construction. Operation would not result in additional impact.	Impacts to cultural and paleontological resources could be addressed in tiered NEPA documents.	Some NRHP-eligible prehistoric and historic resources may exist within the 28.3 ha that would be disturbed during construction. Operation would not result in additional impact.	Impacts to cultural and paleontological resources could be addressed in tiered NEPA documents.	Some NRHP-eligible prehistoric and historic resources may exist within the 24 ha that would be disturbed during construction. Operation would not result in additional impact.	Some NRHP-eligible prehistoric and historic resources may exist within the 20 ha that would be disturbed during construction. Operation would not result in additional impact.
Some Native American resources may be affected by construction and operation.	Some Native American resources may be affected by construction and operation.		Some Native American resources may be affected by construction and operation.		Some Native American resources may be affected by construction and operation.	Some Native American resources may be affected by construction and operation.
Some paleontological resources may occur within the acreage to be disturbed.	Some paleontological resources may occur within the acreage to be disturbed.		Some paleontological resources may occur within the acreage to be disturbed.		Some paleontological resources may occur within the acreage to be disturbed.	Some paleontological resources may occur within the acreage to be disturbed.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

Electrometallurgical Treatment Alternative	MOX Fuel Fabrication Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	Domestic Reactors: Existing Light Water Reactors Alternative (per single unit) *(Preferred Alternative)*	Domestic Reactors: Partially Completed LWR Alternative (per single unit)	Domestic Reactors: Evolutionary LWR Alternative (per single unit)
Cultural and Paleontological Resources				
There would be no impact to NRHP-eligible prehistoric and historic resources.	Some NRHP-eligible prehistoric and historic resources may exist within the 121 ha that would be disturbed during construction.	There would be no impact to NRHP-eligible prehistoric and historic resources.	It is unlikely that prehistoric and historic resources would be affected.	Some NRHP-eligible prehistoric and historic resources may exist within the 284 ha (two-unit large or small) that would be disturbed during construction.
There would be no impact to Native American resources.	Some Native American resources may be affected by construction and operation.	There would be no impact to Native American resources.	Some Native American resources may be affected by operation.	Some Native American resources may be affected by construction and operation.
There would be no impact to paleontological resources.	Some paleontological resources may exist within the acreage to be disturbed.	There would be no impact to paleontological resources.	There would be no impact to paleontological resources.	Some paleontological resources may occur within the acreage to be disturbed.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			Immobilization	
			Immobilized Disposition Alternative			
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*	**Direct Disposition Alternative**	**Ceramic Immobilization Facility**	**Deep Borehole Complex**	**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)*[a]	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)*[a]
Socioeconomics						
Employment for construction would require 185 workers at peak construction and 376 workers annually for life of operations.	Employment for construction would require 358 workers at peak construction and 883 workers annually for the life of operations.	Employment for construction would require 870 workers at peak construction and 342 workers annually for life of operation.	Employment for construction would require 1,000 workers at peak construction and 900 workers annually for life of operation.	Employment for construction would require 810 workers at peak construction and 280 workers annually for life of operation.	Employment for construction would require 382 workers at peak construction and 768 workers annually for life of operation.	Employment for construction would require 1,000 workers at peak construction and 860 workers annually for life of operation.
Employment increases from operation would be about 2 percent.	Employment would increase to a maximum of about 2 percent during operation at some sites.	Indirect jobs created from operations range from 0 to 350.	Employment increases from operation would increase about 2 percent.	Indirect jobs created from operations range from 0 to 350.	Employment increases from operation would be increase almost 2 percent.	Employment increases from operation would be increase about 2 percent.
Changes to local transportation range from no appreciable change to somewhat restricted conditions only during operation. Local transportation would not change appreciably during construction.	Changes to local transportation range from no appreciable change to somewhat restricted conditions only during operation. Local transportation would not change appreciably during construction.	Local transportation should not change appreciably.	Changes to local transportation range from no appreciable change to somewhat restricted conditions during both construction and operation.	Local transportation should not change appreciably.	Changes to local transportation range from no appreciable change to somewhat restricted conditions only during operation. Local transportation would not change appreciably during construction.	Changes to local transportation range from no appreciable change to somewhat restricted conditions during both construction and operation.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit) *(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Socioeconomics				
Construction is not required for this alternative. Employment increase would be 83 workers during full operation.	Employment for construction would require 475 workers at peak construction and 500 workers annually for life operations.	Construction is not required for this alternative (direct and indirect jobs).	Employment would increase less than 1 percent during construction. (direct and indirect jobs).	Employment for construction would require 3,500 workers at peak construction and 830 workers annually for life of operations at the larger evolutionary LWR and 500 workers annually for the life of operations at the small evolutionary LWR.
Indirect jobs created from operations are 223.	Employment at representative sites would increase about 1 percent during operation.	Employment increase would be between 40 and 105 total jobs (direct and indirect jobs).	Employment at representative site would increase less than 1 percent during operation (direct and indirect jobs).	During operation, employment would increase by approximately 1 percent.
Local transportation would not be affected.	Local transportation would not change appreciably.	Local transportation would not be affected.	Local transportation may change from free flow to a somewhat restricted condition during both construction and operation.	Changes to local transportation range from somewhat restricted conditions only during construction to somewhat restricted conditions during both construction and operation.

Table 2.5–3. *Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued*

Pit Disassembly/ Conversion Facility (Preferred Alternative- Hanford, INEL, Pantex, or SRS)	Plutonium Conversion Facility (Preferred Alternative- Hanford or SRS)	Deep Borehole: Direct Disposition Alternative	Deep Borehole: Immobilized Disposition Alternative: Ceramic Immobilization Facility	Deep Borehole: Immobilized Disposition Alternative: Deep Borehole Complex	Immobilization: Vitrification Alternative (Preferred Alternative- Hanford or SRS)[a]	Immobilization: Ceramic Immobilization Alternative (Preferred Alternative- Hanford or SRS)[a]
Public and Occupational Health and Safety						
Normal Radiological Impacts						
The annual dose from this facility to the MEI of the public would range from 1.5×10^{-4} to 1.4×10^{-2} mrem.	The annual dose from this facility to the MEI of the public would range from 9.5×10^{-5} to 9.2×10^{-3} mrem.	The annual dose from this facility to the MEI of the public at representative sites would range from 2.7×10^{-9} to 9.4×10^{-8} mrem.	The annual dose from this facility to the MEI of the public at representative sites would range from 1.6×10^{-8} to 5.9×10^{-7} mrem.	The annual dose from this complex to the MEI of the public at representative sites would range from 3.4×10^{-9} to 1.2×10^{-7} mrem.	The annual dose from this facility to the MEI of the public at representative sites would range from 7.2×10^{-6} to 2.5×10^{-4} mrem.	The annual dose from this facility to the MEI of the public at representative sites would range from 1.2×10^{-7} to 4.2×10^{-6} mrem.
The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from 7.6×10^{-10} to 7.0×10^{-8}.	The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from 4.8×10^{-10} to 4.6×10^{-8}.	The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from 1.4×10^{-14} to 4.7×10^{-13}.	The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from 8.0×10^{-14} to 3.0×10^{-12}.	The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from 1.7×10^{-14} to 6.0×10^{-13}.	The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from 3.6×10^{-11} to 1.3×10^{-9}.	The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from 6.0×10^{-13} to 2.1×10^{-11}.
The annual total dose from this facility to the public within 80 km would range from 2.9×10^{-4} to 0.12 person-rem and would result in an estimated 1.5×10^{-6} to 6.0×10^{-4} fatal cancers from facility lifetime operations.	The annual total dose from this facility to the public within 80 km would range from 1.9×10^{-4} to 0.074 person-rem and would result in an estimated 9.5×10^{-7} to 3.7×10^{-4} fatal cancers from facility lifetime operations.	The annual total dose from this facility to the public within 80 km would range from 5.3×10^{-9} to 1.8×10^{-6} person-rem and would result in an estimated 2.7×10^{-11} to 9.0×10^{-9} fatal cancers from facility lifetime operations.	The annual total dose from this facility to the public within 80 km would range from 3.3×10^{-8} to 1.2×10^{-5} person-rem and would result in an estimated 1.7×10^{-10} to 6.0×10^{-8} fatal cancers from facility lifetime operations.	The annual total dose from this complex to the public within 80 km would range from 6.6×10^{-9} to 2.2×10^{-6} person-rem and would result in an estimated 3.3×10^{-11} to 1.1×10^{-8} fatal cancers from facility lifetime operations.	The annual total dose from this facility to the public within 80 km would range from 1.4×10^{-5} to 5.0×10^{-3} person-rem and would result in an estimated 7.0×10^{-8} to 2.5×10^{-5} fatal cancers from facility lifetime operations.	The annual total dose from this facility to the public within 80 km would range from 1.7×10^{-7} to 6.7×10^{-5} person-rem and would result in an estimated 8.5×10^{-10} to 3.4×10^{-7} fatal cancers from facility lifetime operations.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Public and Occupational Health and Safety				
Normal Radiological Impacts				
The annual dose from this facility to the MEI of the public would be $7.6x10^{-4}$ mrem. The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would be $3.8x10^{-9}$.	The annual dose from this facility to the MEI of the public would range from $6.8x10^{-5}$ to 0.015 mrem. The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would range from $5.8x10^{-10}$ to $1.3x10^{-7}$.	The annual incremental dose from the reactor to the MEI of the public would range from $-1.1x10^{-2}$ to $2.0x10^{-2}$ mrem. The estimated incremental risk of fatal cancer for the MEI of the public from facility lifetime operations would range from $-9.6x10^{-8}$ to $1.7x10^{-7}$.	The annual dose from the reactor to the MEI of the public would be 0.57 mrem. The estimated risk of fatal cancer for the MEI of the public from facility lifetime operations would be $4.9x10^{-6}$.	The range of annual dose from the reactor to the MEI of the public: Large: 0.034 to 4.9 mrem Small: 0.025 to 2.8 mrem The estimated risks of fatal cancer for the MEI of the public from facility lifetime operations: Large: $2.9x10^{-7}$ to $4.1x10^{-5}$ Small: $2.1x10^{-7}$ to $2.4x10^{-5}$.
The annual total dose from this facility to the public within 80 km would be 0.016 person-rem, which would result in an estimated $8.0x10^{-5}$ fatal cancer for the public from facility lifetime operations.	The annual total dose from this facility to the public within 80 km would range from $1.4x10^{-4}$ to 0.14 person-rem, which would result in an estimated $1.2x10^{-6}$ to $1.2x10^{-3}$ fatal cancer for the public from facility lifetime operations.	The annual incremental total dose from the reactor to the public within 80 km would range from -0.046 to 0.20 person-rem, which would result in an estimated $3.8x10^{-3}$ to $1.7x10^{-4}$ incremental fatal cancer for the public from facility lifetime operations.	The annual total dose from the reactor to the public within 80 km would be 0.61 person-rem, which would result in an estimated $5.2x10^{-3}$ fatal cancer for the public from facility lifetime operations.	The range of annual total dose from the reactor to the public within 80 km would be: Large: 0.032 to 32 person-rem Small: 0.022 to 24 person-rem The range of fatal cancer for the total public from facility lifetime operations: Large: $2.7x10^{-4}$ to 0.27 Small: $1.9x10^{-4}$ to 0.21.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			Immobilization	
		Direct Disposition Alternative	Immobilized Disposition Alternative			
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*		**Ceramic Immobilization Facility**	**Deep Borehole Complex**	**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)[a]*	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)[a]*
Public and Occupational Health and Safety (continued)						
Normal Radiological Impacts (continued)						
The average annual dose from this facility to the involved worker would be 200 mrem. The estimated fatal cancer risk for the average involved worker would be $8.0x10^{-4}$ from facility lifetime operations.	The average annual dose from this facility to the involved worker would be 233 mrem. The estimated fatal cancer risk for the average involved worker would be $9.3x10^{-4}$ from facility lifetime operations.	The average annual dose from this facility to the involved worker would be 13 mrem. The estimated fatal cancer risk for the average involved worker would be $5.2x10^{-5}$ from facility lifetime operations (10 years).	The average annual dose from this facility to the involved worker would be 244 mrem. The estimated fatal cancer risk for the average involved worker would be $9.8x10^{-4}$ from facility lifetime operations.	The average annual dose from this facility to the involved worker would be 13 mrem. The estimated fatal cancer risk for the average involved worker would be $5.2x10^{-5}$ from facility lifetime operations.	The average annual dose from this facility to the involved worker would be 200 mrem. The estimated fatal cancer risk for the average involved worker would be $8.0x10^{-4}$ from facility lifetime operations.	The average annual dose from this facility to the involved worker would be 279 mrem. The estimated fatal cancer risk for the average involved worker would be $1.1x10^{-3}$ from facility lifetime operations.
The annual dose from this facility to the workforce would be 83 person-rem, and the number of fatal cancers from facility lifetime operations would be 0.34.	The annual dose from this facility to the workforce would be 133 person-rem, and the number of fatal cancers from facility lifetime operations would be 0.53.	The annual dose from this facility to the workforce would be 2.7 person-rem, and the number of fatal cancers from facility lifetime operations would be 0.011.	The annual dose from this facility to the workforce would be 110 person-rem, and the number of fatal cancers from facility lifetime operations would be 0.44.	The annual dose from this facility to the workforce would be 2.2 person-rem, and the number of fatal cancers from facility lifetime operations would be $8.8x10^{-3}$.	The annual dose from this facility to the workforce would be 110 person-rem, and the number of fatal cancers from facility lifetime operations would be 0.44.	The annual dose from this facility to the workforce would be 120 person-rem, and the number of fatal cancers from facility lifetime operations would be 0.46.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Existing Light Water Reactors Alternative (per single unit)** *(Preferred Alternative)*	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Public and Occupational Health and Safety (continued)				
Normal Radiological Impacts (continued)				
The average annual dose from this facility to the involved worker would be 40 mrem. The estimated fatal cancer risk for the average involved worker would be $1.6x10^{-4}$ from facility lifetime operations.	The average annual dose from this facility to the involved worker would be 250 mrem. The estimated fatal cancer risk for the average involved worker would be $1.7x10^{-3}$ from facility lifetime operations.	The average annual incremental dose from the reactor to the involved worker would range from 1.3 to 2.7 mrem. The estimated incremental fatal cancer risk for the average involved worker would range from $8.0x10^{-6}$ to $1.8x10^{-5}$ from facility lifetime operations.	The average annual dose from the completed reactor to the involved worker would be 360 mrem. The estimated fatal cancer risk for the average involved worker would be $2.4x10^{-3}$ from facility lifetime operations.	The average annual doses to the involved worker would be 810/800 mrem for the large/small reactor, respectively. The estimated fatal cancer risk for the average involved worker would be $5.5x10^{-3}$/$5.4x10^{-3}$ for large/small reactor, respectively, from facility lifetime operations.
The annual dose from this facility to the involved workforce would be 2.9 person-rem, and the estimated number of fatal cancers from facility lifetime operations would be 0.012.	The annual dose from this facility to the involved workforce would be 31 person-rem, and the estimated number of fatal cancers from facility lifetime operations would be 0.21.	The annual incremental dose from this reactor to the involved workforce would be 1.6 person-rem, and the estimated incremental number of fatal cancers from facility lifetime operations would be $1.1x10^{-2}$.	The annual dose from this reactor to the involved workforce would be 380 person-rem, and the estimated number of fatal cancers from facility lifetime operations would be 2.6.	The annual dose from this reactor to the involved workforce would be 170 person-rem for the large reactor and 100 person-rem for the small reactor.
				The estimated number of fatal cancers from facility lifetime operations would be 1.2 for the large reactor and 0.68 for the small reactor.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

Pit Disassembly/ Conversion Facility	Plutonium Conversion Facility	Deep Borehole: Direct Disposition Alternative	Deep Borehole: Immobilized Disposition Alternative – Ceramic Immobilization Facility	Deep Borehole: Immobilized Disposition Alternative – Deep Borehole Complex	Immobilization: Vitrification Alternative	Immobilization: Ceramic Immobilization Alternative
(Preferred Alternative-Hanford, INEL, Pantex, or SRS)	*(Preferred Alternative-Hanford or SRS)*				*(Preferred Alternative-Hanford or SRS)*[a]	*(Preferred Alternative-Hanford or SRS)*[a]
Public and Occupational Health and Safety (continued)						
Hazardous Chemical Impacts						
The chemical HI/cancer risk for the MEI of the public would be between $4.0x10^{-6}$/0 and $1.6x10^{-4}$/0.	The chemical HI/cancer risk for the MEI of the public would be between $4.3x10^{-6}$/ $4.7x10^{-9}$ and $6.2x10^{-4}$/ $1.9x10^{-7}$.	The chemical HI/cancer risk for the MEI of the public would be $1.2x10^{-3}$/0.	The chemical HI/cancer risk for the MEI of the public would be between $2.3x10^{-4}$/0 and $9.1x10^{-3}$/0.	The chemical HI/cancer risk for the MEI of the public would be $1.2x10^{-3}$/0.	The chemical HI/cancer risk for the MEI of the public would be between $1.0x10^{-4}$/0 and $3.9x10^{-3}$/0.	The chemical HI/cancer risk for the MEI of the public would be between $3.9x10^{-4}$/0 and $1.5x10^{-2}$/0.
The site worker HI/ cancer risk would be between $2.6x10^{-4}$/0 and $5.3x10^{-4}$/0.	The site worker HI/ cancer risk would be between $8.0x10^{-4}$/ $7.2x10^{-6}$ and $3.3x10^{-3}$/$1.5x10^{-5}$.	The site worker HI/ cancer risk would be 0.29/0.	The site worker HI/ cancer risk would be between $7.2x10^{-2}$/0 and 0.15/0.	The site worker HI/ cancer risk would be 0.28/0.	The site worker HI/ cancer risk would be between $1.9x10^{-2}$/0 and $4.0x10^{-2}$/0.	The site worker HI/ cancer risk would be between $8.1x10^{-2}$/0 and 0.17/0.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Public and Occupational Health and Safety (continued)				
Hazardous Chemical Impacts				
The chemical HI/cancer risk for the MEI of the public would be 1.8×10^{-6}/0.	The chemical HI/cancer risk for the MEI of the public would be between 4.9×10^{-6}/0 and 1.9×10^{-4}/0.	The chemical HI/cancer risk for the MEI of the public would not change.	The chemical HI/cancer risk for the MEI of the public and site worker would not increase due to construction. Operation impacts would be the same as stated in the Bellefonte Final PEIS (May 1974).	The chemical HI/cancer risk would be as follows: Maximally exposed member of the public would be 2.8×10^{-8}/0 to 1.1×10^{-6}/0 for the large reactor and 2.8×10^{-8}/0 to 1.1×10^{-6}/0 for the small reactor.
The site worker HI would be 1.6×10^{-5}/0.	The site worker HI/cancer risk would be between 8.0×10^{-4}/0 and 1.7×10^{-3}/0.	The chemical HI/cancer risk for the site worker would not change.		Site worker range would be 7.8×10^{-6}/0 to 1.6×10^{-5}/0 for the large reactor and 7.8×10^{-6}/0 to 1.6×10^{-5}/0 for the small reactor.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			Immobilization	
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*	**Direct Disposition Alternative**	**Immobilized Disposition Alternative**		**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)*[a]	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)*[a]
			Ceramic Immobilization Facility	**Deep Borehole Complex**		
Public and Occupational Health and Safety (continued)						
Facility Accidents						
Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point (or at the site boundary if less than 1,000 m) to the MEI of the public located at the site boundary and to the general population residing within 80 km from each site, the maximum and minimum impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point (or at the site boundary if less than 1,000 m) to the MEI of the public located at the site boundary and to the general population residing within 80 km from each site, the maximum and minimum impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point (or at the site boundary if less than 1,000 m) to the MEI of the public located at the site boundary and to the general population residing within 80 km from the reference site, the range of impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point (or at the site boundary if less than 1,000 m) to the MEI of the public located at the site boundary and to the general population residing within 80 km from each site, the maximum and minimum impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point (or at the site boundary if less than 1,000 m) to the MEI of the public located at the site boundary and to the general population residing within 80 km from the reference site, the range of impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point (or at the site boundary if less than 1,000 m) to the MEI of the public located at the site boundary and to the general population residing within 80 km from each site, the maximum and minimum impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	Based on the estimated impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point (or at the site boundary if less than 1,000 m) to the MEI of the public located at the site boundary and to the general population residing within 80 km from each site, the maximum and minimum impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Public and Occupational Health and Safety (continued)				
Facility Accidents				
The estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a noninvolved worker at 230 m, the MEI at the site boundary and the general population residing within 80 km from the site; and corresponding to a 10-year facility lifetime risk would be:	The estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point or at the site boundary if less than 1,000 m, to the MEI of the public located at the site boundary, and to the general population residing within 80 km from each site; and the maximum and minimum impacts to population and corresponding 17-year facility lifetime risks to population, worker, and MEI of the public would be:	The estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point or at the site boundary if less than 1,000 m, to the MEI of the public located at the site boundary, and to the general population residing within 80 km from each site; and the maximum and minimum impacts to population and corresponding 17-year facility lifetime risks to population, worker, and MEI of the public would be:	The estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point or at the site boundary if less than 1,000 m, to the MEI of the public located at the site boundary, and to the general population residing within 80 km from each site; and the maximum and minimum impacts to population and corresponding 17-year facility lifetime risks to population, worker, and MEI of the public would be:	The estimated maximum impacts from a set of potential accidents that propagate radioactive exposure to a worker at 1,000 m from the release point, to the MEI of the public located at the site boundary, and to the general population residing within 80 km from each site; and the maximum and minimum impacts to population and corresponding 17-year facility lifetime risks to population, worker, and MEI of the public would be:

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			Immobilization	
			Immobilized Disposition Alternative			
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*	**Direct Disposition Alternative**	**Ceramic Immobilization Facility**	**Deep Borehole Complex**	**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)*[a]	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)*[a]
Public and Occupational Health and Safety (continued)						
Facility Accidents (continued)						
Probability of cancer fatality/risk to: Worker at 1,000 m or at the site boundary if less than 1,000 m: $1.1x10^{-13}/4.9x10^{-17}$ to $1.5x10^{-4}/7.5x10^{-7}$ (at 772 m)	**Probability of cancer fatality/risk to: Worker at 1,000 m or at the site boundary if less than 1,000 m:** $8.2x10^{-14}/3.7x10^{-17}$ to $1.1x10^{-4}/5.6x10^{-7}$	**Probability of cancer fatality/risk to: Worker at 1,000 m or at the site boundary if less than 1,000 m:** $2.1x10^{-14}/2.1x10^{-16}$ to $1.4x10^{-5}/1.4x10^{-9}$	**Probability of cancer fatality/risk to: Worker at 1,000 m or at the site boundary if less than 1,000 m:** $2.3x10^{-16}/2.3x10^{-18}$ to $1.4x10^{-5}/1.4x10^{-9}$	**Probability of cancer fatality/risk to: Worker at 1,000 m or at the site boundary if less than 1,000 m:** $2.3x10^{-17}/2.3x10^{-19}$ to $1.4x10^{-5}/1.4x10^{-10}$	**Probability of cancer fatality/risk to: Worker at 1,000 m or at the site boundary if less than 1,000 m:** $6.9x10^{-13}/6.9x10^{-15}$ to $6.9x10^{-6}/6.9x10^{-8}$	**Probability of cancer fatality/risk to: Worker at 1,000 m or at the site boundary if less than 1,000 m:** $1.5x10^{-11}/1.5x10^{-16}$ to $4.2x10^{-4}/4.2x10^{-9}$
MEI: $2.7x10^{-15}/1.2x10^{-18}$ to $1.9x10^{-4}/9.3x10^{-7}$	**MEI:** $2.1x10^{-15}/9.3x10^{-19}$ to $1.4x10^{-4}/7.0x10^{-7}$	**MEI:** $4.7x10^{-16}/4.7x10^{-18}$ to $2.9x10^{-6}/2.9x10^{-10}$	**MEI:** $5.7x10^{-18}/5.7x10^{-20}$ to $2.9x10^{-6}/2.9x10^{-10}$	**MEI:** $5.2x10^{-19}/5.2x10^{-21}$ to $2.9x10^{-6}/2.9x10^{-11}$	**MEI:** $1.7x10^{-14}/1.7x10^{-16}$ to $1.4x10^{-6}/1.4x10^{-8}$	**MEI:** $3.5x10^{-13}/3.5x10^{-18}$ to $8.6x10^{-5}/8.6x10^{-10}$
Population: Number of cancer fatalities/risk: $4.5x10^{-13}/2.0x10^{-16}$ to $3.5x10^{-2}/1.7x10^{-4}$.	**Population:** Number of cancer fatalities/risk: $3.4x10^{-13}/1.5x10^{-16}$ to $2.6x10^{-2}/1.3x10^{-4}$.	**Population:** Number of cancer fatalities/risk: $8.4x10^{-14}/8.4x10^{-16}$ to $6.3x10^{-4}/6.3x10^{-8}$.	**Population:** Number of cancer fatalities/risk: $9.3x10^{-16}/9.3x10^{-18}$ to $6.3x10^{-4}/6.3x10^{-8}$.	**Population:** Number of cancer fatalities/risk: $9.3x10^{-17}/9.3x10^{-19}$ to $6.3x10^{-4}/6.3x10^{-9}$.	**Population:** Number of cancer fatalities/risk: $2.8x10^{-12}/2.8x10^{-14}$ to $1.8x10^{-3}/1.8x10^{-5}$.	**Population:** Number of cancer fatalities/risk: $7.0x10^{-11}/7.0x10^{-16}$ to $1.9x10^{-2}/1.9x10^{-7}$.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

Electrometallurgical Treatment Alternative	MOX Fuel Fabrication Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	Domestic Reactors: Existing Light Water Reactors Alternative (per single unit) *(Preferred Alternative)*	Domestic Reactors: Partially Completed LWR Alternative (per single unit)	Domestic Reactors: Evolutionary LWR Alternative (per single unit)
Public and Occupational Health and Safety (continued)				
Facility Accidents (continued)				
Probability of cancer fatality/ risk to: **Worker at 1,000 m or at site boundary if less than 1,000 m:** $5.2\times10^{-7}/5.2\times10^{-10}$	**Probability of cancer fatality/ risk to:** **Worker at 1,000 m or at site boundary if less than 1,000 m:** $1.1\times10^{-13}/8.1\times10^{-17}$ to $1.4\times10^{-4}/1.3\times10^{-6}$	**Probability of cancer fatality/ risk to:** **Worker at 1,000 m or at site boundary if less than 1,000 m:** $1.0 / 2.2\times10^{-6}$ to $0.79/1.1\times10^{-4}$ to	**Probability of cancer fatality/ risk to:** **Worker at 1,000 m or at site boundary if less than 1,000 m:** $1.0 / 2.2\times10^{-6}$ to $0.79/1.1\times10^{-4}$ to	**Probability of cancer fatality/ risk to:** **Worker at 1,000 m or at site boundary if less than 1,000 m:** $2.6\times10^{-7}/4.5\times10^{-11}$ to $2.8\times10^{-2}/6.1\times10^{-8}$
MEI: $3.5\times10^{-8}/3.5\times10^{-11}$	**MEI:**$4.3\times10^{-15}/3.3\times10^{-18}$ to $1.8\times10^{-4}/1.6\times10^{-6}$	**MEI:**$1.0/2.2\times10^{-6}$ to $0.86/1.2\times10^{-4}$	**MEI:**$1.0/2.2\times10^{-6}$ to $0.86/1.2\times10^{-4}$	**MEI:** $6.3\times10^{-9}/1.1\times10^{-12}$ to $3.5\times10^{-2}/7.7\times10^{-8}$
Population: Number of cancer fatalities/risk: $3.7\times10^{-6}/3.7\times10^{-9}$.	**Population:** Number of cancer fatalities/risk: $4.5\times10^{-13}/3.4\times10^{-16}$ to $3.7\times10^{-2}/3.2\times10^{-4}$.	**Population:** Number of cancer fatalities/risk: $7.3\times10^{3}/0.016$ to $5.9\times10^{3}/0.15$.[b]	**Population:** Number of cancer fatalities/risk: $7.3\times10^{3}/0.016$ to $5.9\times10^{3}/0.15$.[b]	**Population:** Number of cancer fatalities/risk: $5.6\times10^{-7}/9.6\times10^{-11}$ to $22/7.9\times10^{-6}$.
		A typical accident scenario where use of MOX fuel would replace UO_2 fuel would increase latent cancer fatalities by up to 8 percent (see Table 4.3.5.2.9–5).	A typical accident scenario where use of MOX fuel would replace UO_2 fuel would increase latent cancer fatalities by up to 8 percent (see Table 4.3.5.2.9–5).	

[b]The accident conditions include the following: (1) a large population near the LWR, and (2) meteorological conditions for dispersal leading to large doses. These conditions would not necessarily be reflective of actual site conditions.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

Pit Disassembly/ Conversion Facility	Plutonium Conversion Facility	Deep Borehole			Immobilization	
		Direct Disposition Alternative	Immobilized Disposition Alternative		Vitrification Alternative	Ceramic Immobilization Alternative
(Preferred Alternative-Hanford, INEL, Pantex, or SRS)	*(Preferred Alternative-Hanford or SRS)*		Ceramic Immobilization Facility	Deep Borehole Complex	*(Preferred Alternative-Hanford or SRS)[a]*	*(Preferred Alternative-Hanford or SRS)[a]*
Public and Occupational Health and Safety (continued)						
Facility Accidents (continued) - Preferred Alternative						
The maximum and minimum impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	The maximum and minimum impacts to population and corresponding 10-year facility lifetime risks to population, worker, and MEI of the public would be:	This alternative does not apply to the Preferred Alternative.	This alternative does not apply to the Preferred Alternative.	This alternative does not apply to the Preferred Alternative.	The maximum and minimum impacts to population and corresponding 3.5-year[c] facility lifetime risks to population, worker, and MEI of the public would be:	The maximum and minimum impacts to population and corresponding 3.5-year[c] facility lifetime risks to population, worker, and MEI of the public would be:
Probability of cancer fatality/risk to: **Worker at 1,000 m or at the Site Boundary if less than 1,000 m:** $1.1x10^{-13}/4.9x10^{-17}$ to $1.3x10^{-4}/6.4x10^{-7}$	**Probability of cancer fatality/risk to:** **Worker at 1,000 m or at the Site Boundary if less than 1,000 m:** $1.3x10^{-13}/6.0x10^{-17}$ to $9.7x10^{-5}/4.8x10^{-7}$				**Probability of cancer fatality/risk to:** **Worker at 1,000 m or at the Site Boundary if less than 1,000 m:** $1.1x10^{-12}/3.8x10^{-15}$ to $6.9x10^{-6}/2.4x10^{-8}$	**Probability of cancer fatality/risk to:** **Worker at 1,000 m or at the Site Boundary if less than 1,000 m:** $2.4x10^{-11}/8.4x10^{-17}$ to $4.2x10^{-4}/1.5x10^{-9}$
MEI: $2.7x10^{-15}/1.2x10^{-18}$ to $5.1x10^{-6}/2.5x10^{-8}$	**MEI:** $3.3x10^{-15}/1.5x10^{-18}$ to $3.8x10^{-6}/1.9x10^{-8}$				**MEI:** $1.7x10^{-14}/6.0x10^{-17}$ to $1.1x10^{-7}/3.8x10^{-10}$	**MEI:** $3.5x10^{-13}/1.2x10^{-18}$ to $6.0x10^{-6}/2.1x10^{-11}$
Population: Number of cancer fatalities/risk: $5.9x10^{-12}/2.7x10^{-15}$ to $9.9x10^{-3}/5.0x10^{-5}$.	**Population:** Number of cancer fatalities/risk: $1.5x10^{-11}/6.7x10^{-15}$ to $7.0x10^{-3}/3.5x10^{-5}$.				**Population:** Number of cancer fatalities/risk: $3.4x10^{-6}/4.5x10^{-13}$ to $8.4x10^{-4}/2.9x10^{-6}$.	**Population:** Number of cancer fatalities/risk: $3.2x10^{-9}/1.1x10^{-14}$ to $6.1x10^{-3}/2.1x10^{-8}$.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

[c] For purpose of analysis, approximately 30 percent surplus Pu would be immobilized, and approximately 70 percent surplus Pu would be used in reactors; therefore, the total duration for the campaign would reduced, resulting in reduced lifetime risks.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative- Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
Public and Occupational Health and Safety (continued)				
Facility Accidents (continued) - Preferred Alternative				
This alternative does not apply to the Preferred Alternative.	The maximum and minimum impacts to population and corresponding 11-year[c] facility lifetime risks to population, worker, and MEI of the public would be: **Probability of cancer fatality/ risk to:** **Worker at 1,000 m or at the site boundary if less than 1,000 m:** $1.1\text{x}10^{-13}/5.3\text{x}10^{-17}$ to $1.3\text{x}10^{-4}/7.1\text{x}10^{-7}$ **MEI:** $6.2\text{x}10^{-15}/3.0\text{x}10^{-18}$ to $2.0\text{x}10^{-5}/1.1\text{x}10^{-7}$ **Population:** Number of cancer fatalities/risk: $4.5\text{x}10^{-13}/2.2\text{x}10^{-16}$ to $3.7\text{x}10^{-2}/2.1\text{x}10^{-4}$.	The maximum and minimum impacts to population and corresponding 11-year[c] facility lifetime risks to population, worker, and MEI of the public would be: **Probability of Cancer fatality/ risk to:** **Worker at 1,000 m or at the site boundary if less than 1,000 m:** 1.0 / $1.4\text{x}10^{-6}$ to 0.79 / $7.2\text{x}10^{-5}$ **MEI:** 1.0 / $4.8\text{x}10^{-6}$ to 0.86 / $7.8\text{x}10^{-5}$ **Population:** Number of cancer fatalities/risk: $7.3\text{x}10^{3}$ / 0.010 to $5.9\text{x}10^{3}$ / 0.098.[b] A typical accident scenario where use of MOX fuel would replace UO_2 fuel would increase latent cancer fatalities by up to 8 percent (see Table 4.5.2.9–5).	This alternative does not apply to the Preferred Alternative.	This alternative does not apply to the Preferred Alternative.

[b] The accident conditions include the following: (1) a large population near the LWR, and (2) meteorological conditions for dispersal leading to large doses. These conditions would not necessarily be reflective of actual site conditions.

[c] For purpose of analysis, approximately 30 percent surplus Pu would be immobilized, and approximately 70 percent surplus Pu would be used in reactors; therefore, the total duration for the campaign would reduced, resulting in reduced lifetime risks.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			**Immobilization**	
			Immobilized Disposition Alternative			
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*	**Direct Disposition Alternative**	**Ceramic Immobilization Facility**	**Deep Borehole Complex**	**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)*[a]	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)*[a]
Waste Management						
The increases in the annual generation of liquid/solid waste over No Action are as follows:	The increases in the annual generation of liquid/solid waste over No Action are as follows:	The increases in the annual generation of liquid/solid waste for a generic site over No Action are as follows:	The increases in the annual generation of liquid/solid waste over No Action are as follows:	The increases in the annual generation of liquid/solid waste for a generic site over No Action are as follows:	The increases in the annual generation of liquid/solid waste over No Action are as follows:	The increases in the annual generation of liquid/solid waste over No Action are as follows:
TRU: 0 m^3/67 m^3	TRU: 3.2 m^3/278 m^3	TRU: 0.2 m^3/0.2 m^3	TRU: 110 m^3/150 m^3	TRU: 0.5 m^3/0.5 m^3	TRU: 0.8 m^3/99 m^3	TRU: 75 m^3/99 m^3
Mixed TRU: 0 m^3/ 4 m^3	Mixed TRU: 0 m^3/ 191 m^3	Mixed TRU: 0 m^3/ 0.04 m^3	Mixed TRU: 0 m^3/ 1.5 m^3	Mixed TRU: 0 m^3/ 0.1 m^3	Mixed TRU: 0 m^3/ 0.7 m^3	Mixed TRU: 0 m^3/ 0.7 m^3
LLW: 4 m^3 /102 m^3	LLW: 56 m^3/1,743 m^3	LLW: 2 m^3/5 m^3	LLW: 10 m^3/23 m^3	LLW: 3 m^3/6 m^3	LLW: 7 m^3/14 m^3	LLW:7 m^3/14 m^3
Mixed LLW: 0.4 m^3/ 1.7 m^3	Mixed LLW: 0.04 m^3/ 191 m^3	Mixed LLW: 0 m^3/0 m^3	Mixed LLW: 0 m^3/ 0.3 m^3	Mixed LLW: 0 m^3/0 m^3	Mixed LLW: 0 m^3 / 0.15 m^3	Mixed LLW: 0 m^3/ 0.15 m^3
HAZ: 2 m^3/0.7 m^3	HAZ: 2 m^3/11 m^3	HAZ: 110 m^3/17 m^3	HAZ: 45 m^3/23 m^3	HAZ: 141 m^3/15 m^3	HAZ: 19 m^3/19 m^3	HAZ: 38 m^3/19 m^3
Nonhaz (sanitary): 85,200 m^3/100 m^3	Nonhaz (sanitary): 15,000 m^3 /2,060 m^3	Nonhaz (sanitary): 10,600 m^3/306 m^3	Nonhaz (sanitary): 43,000 m^3/910 m^3	Nonhaz (sanitary): 9,460 m^3/291 m^3	Nonhaz (sanitary): 34,000 m^3/920 m^3	Nonhaz (sanitary): 34,000 m^3/920 m^3
Nonhaz (other): Included in sanitary/ 3 m^3.	Nonhaz (other): 56 m^3/0 m^3.	Nonhaz (other): 6,800 m^3/1,250 m^3.	Nonhaz (other): 186,900 m^3/15 m^3.	Nonhaz (other): 6,060 m^3/1,250 m^3.	Nonhaz (other): 269,000 m^3/15 m^3.	Nonhaz (other): 170,000 m^3/15 m^3.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Existing Light Water Reactors Alternative (per single unit)** *(Preferred Alternative)*	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
		Waste Management		
		Spent nuclear fuel generation would increase approximately 14 t (PWR) and 3 t (BWR).	Spent nuclear fuel generation would increase approximately 22 t to 47 t per reactor.	Spent nuclear fuel generation would increase approximately 38.2 t/reactor for large (2 reactors) and 17.7 t/reactor for small (4 reactors).
The net increase in the annual generation of liquid/solid waste as a result of electrometallurgical treatment of surplus materials is as follows:	The net increase in the annual generation of liquid/solid waste over No Action is as follows:	There would be no increase in the amount of waste generated.	The range of increase in the annual generation of liquid/solid waste for a representative site over No Action is as follows:	The range of increase in the annual generation of liquid/solid waste over No Action is as follows:
TRU: 0 m^3/6 m^3	TRU: 0 m^3/ 306 m^3	TRU: 0 m^3/0 m^3	TRU: Not generated.	TRU: Not generated.
Mixed TRU: 0 m^3/0.8 m^3	Mixed TRU: 0 m^3/4 m^3	Mixed TRU: 0 m^3/0 m^3	Mixed TRU: Not generated.	Mixed TRU: Not generated.
LLW: 2 m^3/55 m^3	LLW: 4 m^3/153 m^3	LLW: 0 m^3/0 m^3	LLW:18,930 m^3/57-637 m^3	LLW: Large: 18,900 m^3/500 m^3 Small: 2,990 m^3/270 m^3
Mixed LLW: 0 m^3/0.8 m^3	Mixed LLW: 0.8 m^3/38 m^3	Mixed LLW: 0 m^3/0 m^3	Mixed LLW: 0 m^3/102 m^3	Mixed LLW: Large: 0 m^3/5 m^3 Small: 0 m^3/5 m^3
HAZ: 0 m^3/0.8 m^3	HAZ: 4 m^3/153 m^3	HAZ: 0 m^3/0 m^3	HAZ: Included in solid/ 27 m^3	HAZ: Large: Included in solid/ 27 m^3 Small: Included in solid/27 m^3
Nonhaz (sanitary): 1,550 m^3/1,500 m^3	Nonhaz (sanitary): 43,300 m^3/76 m^3	Nonhaz: 0 m^3/0 m^3	Nonhaz (sanitary): 341,000 m^3/5,280 m^3	Nonhaz (sanitary): Large: 23,900,000 (wet site) 342,000 m^3 (dry site)/5,280 m^3 Small: 11,000,000 (wet site) 190,000 (dry site)/3,210 m^3.
Nonhaz (other): 2,990 m^3/0.8 m^3	Nonhaz (other): 227 m^3/84 m^3	Nonhaz (other): 0 m^3/0 m^3	Nonhaz (other): Included in sanitary/4,430 m^3	Nonhaz (other): Large: Included in sanitary/ 4,430 m^3 Small: Included in sanitary/ 2,680 m^3

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

Pit Disassembly/ Conversion Facility (*Preferred Alternative- Hanford, INEL, Pantex, or SRS*)	Plutonium Conversion Facility (*Preferred Alternative- Hanford or SRS*)	Deep Borehole			Immobilization	
		Direct Disposition Alternative	Immobilized Disposition Alternative		Vitrification Alternative (*Preferred Alternative- Hanford or SRS*)[a]	Ceramic Immobilization Alternative (*Preferred Alternative- Hanford or SRS*)[a]
			Ceramic Immobilization Facility	Deep Borehole Complex		
Intersite Transportation[d]						
Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to pit disassembly/ conversion range from 0 to 0.203.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to Pu conversion range from 0 to 0.635.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to direct disposition alternative through Pu conversion facility range from 0 to 1.18.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to ceramic immobilization facility through Pu conversion facility is included in borehole complex.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to borehole complex through Pu conversion and ceramic immobilization facilities range from 0 to 2.12.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to HLW repository through Pu conversion and vitrification range from 0 to 1.43.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to HLW repository through ceramic immobilization range from 0 to 1.43.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

[d] Detailed information is provided in the classified Appendix.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors			
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**	**CANDU Reactor Alternative**
Intersite Transportation[d]					
Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to electrometallurgical treatment through pit disassembly/conversion and Pu conversion facility range from 0 to 0.923.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to MOX fuel fabrication site range from 0 to 0.552.	The potential fatalities from the intersite transportation of Pu from existing storage sites to existing light water reactor through pit disassembly/conversion and Pu conversion including transport of SNF to HLW repository site facility range from 0 to 5.65.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to partially completed light water reactor through pit disassembly/conversion and Pu conversion including transport of SNF to HLW repository site range from 0 to 5.65.	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to evolutionary light water reactor through pit disassembly/conversion and Pu conversion facility including transport of SNF to HLW repository site range from: 0 to 5.65 (large) and 0 to 5.65 (small).	Maximum potential fatalities from the intersite transportation of Pu from existing storage sites to U.S./Canadian border range from 0 to 5.00.

[d] Detailed information is provided in the classified Appendix.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Deep Borehole			Immobilization	
			Immobilized Disposition Alternative			
Pit Disassembly/ Conversion Facility *(Preferred Alternative-Hanford, INEL, Pantex, or SRS)*	**Plutonium Conversion Facility** *(Preferred Alternative-Hanford or SRS)*	**Direct Disposition Alternative**	**Ceramic Immobilization Facility**	**Deep Borehole Complex**	**Vitrification Alternative** *(Preferred Alternative-Hanford or SRS)*[a]	**Ceramic Immobilization Alternative** *(Preferred Alternative-Hanford or SRS)*[a]
Environmental Justice						
No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.

[a] Either vitrification or ceramic immobilization would be implemented for immobilization of surplus Pu under the Preferred Alternative, but not both.

Table 2.5–3. Summary Comparison of Environmental Impacts for Plutonium Disposition Alternatives (Including the Preferred Alternative)—Continued

		Domestic Reactors		
Electrometallurgical Treatment Alternative	**MOX Fuel Fabrication Facility** ***(Preferred Alternative-Hanford, INEL, Pantex, or SRS)***	**Existing Light Water Reactors Alternative (per single unit)** ***(Preferred Alternative)***	**Partially Completed LWR Alternative (per single unit)**	**Evolutionary LWR Alternative (per single unit)**
		Environmental Justice		
No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.	No high or adverse impacts from normal operations or accidents that could disproportionately affect minority or low-income populations.

Chapter 3
Affected Environment

3.1 DESCRIPTION OF ENVIRONMENTAL RESOURCES

The affected environment descriptions presented in this chapter provide the context for understanding the environmental consequences described in Chapter 4. As such, they serve as a baseline from which any environmental changes that may be brought about by implementation of the proposed action and alternatives can be identified and evaluated. The DOE sites evaluated include Hanford, NTS, INEL, Pantex, ORR, SRS, RFETS, and LANL. All eight DOE sites were evaluated under the No Action Alternative, and the first six were evaluated for long-term storage and disposition alternatives. Six of the DOE sites were evaluated for various disposition alternatives (for example, evolutionary LWR). The generic sites evaluated include a borehole site, a commercial MOX fuel fabrication facility, an existing LWR, and a partially completed LWR. The natural and human resources, as well as the facility-related resources that may be affected by the proposed action, are grouped into the following interest areas for analysis in this PEIS:

- Land resources
- Site infrastructure
- Air quality and noise
- Water resources
- Geology and soils
- Biological resources
- Cultural and paleontological resources
- Socioeconomics
- Public and occupational health and safety
- Waste management

In addition, the existing conditions and potential environmental impacts of intersite transportation of materials and environmental justice associated with the proposed action are described in Sections 4.4 and 4.5, respectively.

The alternatives defined in Chapter 2 are associated with the long-term storage of weapons-usable fissile materials and disposition of surplus Pu. In addition to these proposed actions, the No Action Alternative has also been assessed.