4.2.3.7 Cultural and Paleontological Resources

Preferred Alternative: No Action Alternative

Under this alternative, DOE would continue the existing and planned missions at INEL, which include continued storage of Pu material at ANL-W within the ZPPR and FMF vaults in stabilized form pursuant to DNFSB Recommendation 94-1. Management of INEL's cultural resources is done within the framework of the *INEL Draft Management Plan for Cultural Resources* (DOE/ID-10361, July 1995). Any impacts on cultural or paleontological resources from these missions would be independent of the proposed action and would be addressed through separate NHPA, *American Indian Religious Freedom Act*, and *Native American Graves Protection and Repatriation Act* regulatory compliance procedures.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

The new ANL-W facility is the proposed storage area under this alternative. This option involves new construction and modification of buildings 704, 774, and 775. [Text deleted.] Most of the land required for construction and operation has already been disturbed. Surface surveys have been conducted in some of the areas to be affected. In accordance with INEL's *Draft Management Plan for Cultural Resources*, surveys would be conducted in unsurveyed areas prior to construction. Discovery of any archaeological materials during construction would result in a work stoppage. Prehistoric site types that are known to occur at INEL include campsites, lithic workshops, cairns, and hunting blinds. Remains of small homesteads, sheep and cattle camps, stage and wagon trails, and abandoned towns comprise the historic component of archaeological resources at INEL. Any number of these may occur in areas slated for development. In addition, all of the facilities at INEL are considered potentially eligible for listing on the NRHP. Most have not yet been formally evaluated. These properties are managed within a framework established by DOE, the Idaho SHPO, and the Advisory Council on Historic Preservation.

Some Native American resources, such as archaeological sites and traditionally used plant and animal species, may be affected by construction of new facilities. Operation may affect other resources in the form of reduced access to traditional use areas and visual or auditory impact to sacred sites. The entire INEL site is considered sacred land to the Shoshone Bannock Tribe. DOE has established a Working Agreement with this group and consultation with them may identify resources that may be affected by the proposed alternative.

Although surface exposures of fossiliferous formations do not exist in the proposed location, ground-breaking construction could affect some paleontological resources. There are 31 known fossil localities at INEL, and more may exist. These materials sometimes occur in association with prehistoric archaeological sites and have high research potential.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Land requirements during construction and operation would not change under this subalternative. Impacts on cultural and paleontological resources with all or some RFETS and LANL material would be the same as described in the Upgrade Without RFETS Pu or LANL Pu Subalternative.

Consolidation Alternative

Construct New Plutonium Storage Facility

A consolidated special nuclear material storage plant would be constructed southeast of the Big Lost River and ICPP. Land disturbance during construction would total approximately 58.5 ha (144 acres), and the operational land disturbance would be 56 ha (138 acres). A reduced-access buffer zone would exist around the facility. Five km (3 mi) of new road or railway may be necessary under this alternative. [Text deleted.] Impacts on cultural and paleontological resources that may result from facility construction and operation under this alternative are similar to those that would occur under the Upgrade Alternative, even though the location is different.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The area disturbed during construction would be 89.5 ha (221 acres), and new facilities would be collocated with the consolidated special nuclear material storage plant. The total operational land requirement would be 87 ha (215 acres). A reduced-access buffer zone would be created around the new facilities. [Text deleted.] Impacts on cultural and paleontological resources that may result from construction and operation under this alternative are similar to those discussed under the Upgrade Alternative, even though the locations differ.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, facility and other resource requirements would be almost the same as the Upgrade With All or Some RFETS Pu and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. Therefore, impacts on cultural and paleontological resources would be equal to those previously discussed. [Text deleted.]

Phaseout

For this activity, all the Pu materials at INEL within the scope of this PEIS would be transferred to another site, and the storage mission would be phased out. Impacts on prehistoric resources are not anticipated because phaseout is not expected to result in ground-breaking activity. Likewise, no impacts on paleontological remains are expected. It may affect, through alteration, if subsequently proposed, some NRHP-eligible historic structures at INEL. Impacts on Native American resources are not expected.

[Text deleted.]

4.2.3.8 Socioeconomics

Preferred Alternative: No Action Alternative

Regional Economy Characteristics. Total employment in the REA is projected to increase approximately 2 percent annually between 1995 and 2000, reaching about 152,600 in the latter year. Long-term projections indicate slower growth after the year 2000, when employment would increase about 1 percent annually and reach approximately 202,500 in 2040. Unemployment in the REA was 5.4 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $17,701 in 1995 to $24,177 in 2040. Projections for the No Action Alternative are presented in Table L.1–28.

Population and Housing. Population in the ROI is projected to increase from approximately 215,300 in 1995 to 304,500 by 2040. The total number of housing units in the ROI is projected to increase from about 74,600 in 1995 to 105,600 in 2040. Population and housing projections for the No Action alternative are presented in Tables L.1–29 and L.1–30, respectively.

Community Services. Education, public safety, and health care characteristics are used to assess the level of community services in the INEL ROI. School enrollments are projected to increase from about 53,460 students in 1995 to 75,630 students by 2040. The current student-to-teacher ratio is 18.5:1. To maintain this service level, the number of teachers in the ROI would need to increase from approximately 2,890 in 1995 to 4,084 in 2040. These projections are presented in Tables L.1–31 and L.1–32.

The projected numbers of sworn police officers and firefighters serving in ROI communities over the period 1995 to 2040 are shown in Tables L.1–33 and L.1–34, respectively. Under No Action, the number of sworn police officers is projected to increase from approximately 344 in 1995 to 487 in 2040 to maintain the current service level of 1.6 sworn officers per 1,000 persons. The number of firefighters in the ROI would need to increase from about 465 in 1995 to 657 in 2040 to maintain the present service level of 2.2 firefighters per 1,000 persons.

Hospital occupancy rates are based on current capacity. These rates and the estimated number of physicians serving the ROI population between 1995 and 2040 are presented in Tables L.1–35 and L.1–36, respectively. Hospital occupancy rates are projected to increase from approximately 51 percent in 1995 to 72 percent in 2040. To maintain the current physician-to-population ratio of 1.2 physicians per 1,000 persons, the total number of physicians in the ROI would need to increase from approximately 267 in 1995 to 378 in 2040.

Local Transportation. Any increases in traffic would be due to projected growth in the area unrelated to DOE activities. [Text deleted.]

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Upgrading existing Pu storage facilities at INEL, without RFETS or LANL material, would create minimal changes within the region. Construction of the facility would require 122 workers, and 81 new employees would be needed to operate the upgraded facility. There would be sufficient labor available in the REA to fill both direct and indirect jobs created from this subalternative. Therefore, no workers would in-migrate to the region and no change to the region's population would result beyond No Action projections.

Regional Economy Characteristics. Construction would generate a total of 248 jobs (122 direct and 126 indirect). Operation would generate a total of 298 jobs (81 direct and 217 indirect). [Text deleted.] Total employment would increase by much less than 1 percent during both construction and operation of the facility. Unemployment would decline from 5.4 percent to 5.2 percent during both construction and operation. Per capita income would increase by much less than 1 percent over the No Action Alternative during both phases (Socio 1996a).

Population, Housing, and Community Services. All newly created employment would be filled by the resident labor force. Therefore, there would be no change to the region's population beyond the No Action level. Accordingly, there would be minimal impacts on the housing sector or community services as a result of the construction and operation of this facility.

Local Transportation. A total of 234 and 156 vehicle trips per day would be generated during the construction and operation phases, respectively. There would be no significant impacts to the local road network during either phase (Socio 1996a).

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Under this option, all or a portion of the RFETS and LANL material would be transferred to INEL. Depending on the modifications required at INEL, between 122 and 144 onsite workers would be employed during construction of the facility. An additional 126 to 148 indirect jobs would also be generated. There would be sufficient available labor in the REA to fill both direct and indirect jobs generated as a result of construction of the upgraded facility. Because constructing a storage facility to include all of the RFETS and LANL material would require at maximum only 22 more workers than a facility that would include none of the material, socioeconomic impacts would be similar to those for the Upgrade Without RFETS Pu or LANL Pu Subalternative.

During the operation phase, 116 workers would be employed if all of the RFETS and LANL material was stored at INEL. However, 35 of these positions would be filled by existing INEL employees. Therefore, only 81 new positions would be created for the operation of the upgraded facility with RFETS and LANL material, which is the same number of personnel required for upgrade without RFETS or LANL material. Therefore, the magnitude of socioeconomic effects for this subalternative would be the same as those discussed above for the Upgrade Without RFETS Pu or LANL Pu Subalternative.

Consolidation Alternative

Construct New Plutonium Storage Facility

To consolidate storage of Pu currently stored at multiple DOE sites, a new storage facility would need to be constructed at INEL. Workers would in-migrate to fill a portion of the direct jobs created during construction and operation of this facility.

Regional Economy Characteristics. Construction would generate a total of 2,237 jobs (1,102 direct and 1,135 indirect). Operation would generate a total of 1,591 jobs (432 direct and 1,159 indirect). Total employment would increase slightly more than 1 percent for construction and approximately 1 percent for operation over No Action projections. Unemployment would decrease to 4.4 percent during construction and 4.5 percent during operation. Per capita income is projected to increase by less than 1 percent for construction and operation (Socio 1996a).

Population and Housing. The in-migration of workers during the construction and operation periods would increase the ROI population by less than 1 percent over No Action projections. The largest increase would occur during construction. Some new housing may be needed. However, expected vacancies and historic housing construction rates indicate that housing would be available to accommodate the population growth (Socio 1996a).

Community Services. The ROI population growth would slightly increase the demand for some community services. Worker in-migration would lead to an increase in ROI school enrollments by about 423 students during construction and 35 students during operation. To maintain the No Action student-to-teacher ratio of 18.5:1, the number of teachers would have to increase by 23 during the construction period and only two during operation (Socio 1996a). Since this additional need for teachers would be distributed over the various jurisdictions in the ROI, the effect on any single school district would be minimal.

To maintain current levels of service, only three police officers and four firefighters would need to be hired during the construction period. No additional police officers or firefighters would be required to maintain current service levels during operation (Socio 1996a).

The small population change would have a negligible effect on health services, increasing hospital occupancy by much less than 1 percent during construction and operation. The number of physicians in the ROI would need to increase by only two during construction to maintain the current service level. No additional physicians would be needed during operation (Socio 1996a).

Local Transportation. A total of 2,116 and 829 vehicle trips per day would be generated during the construction and operation phases, respectively. Construction would cause a drop in the level of service on U.S. 20/26 from U.S. 26 East to State Route 22/33. U.S. 20/26 level of service would change from B to C. Traffic generated from facility operations would not affect the level of service on the local road segments analyzed (Socio 1996a).

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

To collocate storage of Pu and HEU that is currently stored at multiple DOE sites, a new storage facility would need to be constructed at INEL. Workers would in-migrate to fill a portion of the direct jobs created during construction and operation of this facility.

Regional Economy Characteristics. Construction would generate a total of 2,932 jobs (1,444 direct and 1,488 indirect). Operation would generate a total of 2,066 jobs (561 direct and 1,505 indirect). Total employment would increase by about 2 percent for construction and slightly more than 1 percent for operation over No Action projections. Unemployment would decrease to 4.2 percent during construction and operation. Per capita income is projected to increase by less than 1 percent during construction and by about 1 percent during operation (Socio 1996a).

Population and Housing. The in-migration of workers during the construction and operation periods would increase the ROI population by slightly more than 1 percent and much less than 1 percent over No Action projections, respectively. The largest growth would occur during construction. Some new housing may be needed. However, expected vacancies and historic housing construction rates indicate that housing would be available to accommodate the population growth (Socio 1996a).

Community Services. The additional population would slightly increase the demand for some community services. Worker in-migration would lead to an increase in ROI school enrollments by about 646 students during construction and 82 students during operation. To maintain the No Action student-to-teacher ratio of 18.5:1, the

number of teachers would have to increase by 35 during the construction period and by 4 during operation (Socio 1996a). Since this additional need for teachers would be distributed over the various jurisdictions in the ROI, the effect on any single school district would be minimal.

To maintain No Action levels of service, four police officers and six firefighters would need to be hired during the construction period. Only one additional police officer and firefighter would be required to maintain current service levels during operation (Socio 1996a).

The small population increase would have a negligible effect on health services, increasing hospital occupancy by much less than 1 percent during construction and operation. The number of physicians in the ROI would need to increase by four during peak construction to maintain the No Action level of service. No additional physicians would be needed during operation (Socio 1996a).

Local Transportation. A total of 2,772 and 1,077 vehicle trips per day would be generated during the construction and operation phases, respectively. Traffic generated during construction would cause a drop in the level of service on U.S. 20 from U.S 26/91 at Idaho Falls to U.S. 26 East. The level of service would change from D to E. The level of service on U.S. 20/26 from U.S. 26 East to ID 22/33 would change from B to C. Traffic generated from facility operations would not affect the level of service on the local road segments analyzed (Socio 1996a).

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The requirements for each storage option considered would decrease slightly if strategic reserve and weapons R&D materials were not included for storage at INEL. This should result in a decrease in the number of required operation employees for each of the considered alternatives. Therefore, socioeconomic effects on the REA/ROI for the storage alternatives with no strategic reserve and weapons R&D materials should be equal to, or somewhat less than, the Upgrade with All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

Phasing out Pu storage at INEL would result in no loss of jobs in the REA. Only four to five workers are employed in this storage area, and they would be relocated to other areas. Thus, the socioeconomic effects for the phaseout alternative would be the same as discussed under No Action.

4.2.3.9 Public and Occupational Health and Safety

The assessments of potential radiological and chemical impacts associated with the storage alternatives at INEL are presented in this section. Summaries of radiological impacts from normal operations are presented in Tables 4.2.3.9–1 and 4.2.3.9–2 for the public and workers, respectively. Impacts from hazardous chemicals are presented in Table 4.2.3.9–3. Summaries of impacts associated with postulated accidents are given in Tables 4.2.3.9–4 through 4.2.3.9–7. Detailed results are presented in Appendix M.

Preferred Alternative: No Action Alternative

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from normal operations involved with the sitewide INEL missions, including interim storage of Pu. The impacts would be within applicable regulatory limits. For facility accidents, the risks and consequences are described in site safety documentation.

Normal Operation. The current mission at INEL, where Pu is in interim storage, is described in Section 3.4. The site has identified those facilities that will continue to operate under the No Action Alternative, including interim Pu storage facilities and others, if any, that will become operational by 2005. Based on that information, the radiological and chemical releases to the environment in 2005 and beyond (future operation) were developed and used in the impact assessments. The resulting doses and potential health effects on the public and workers at INEL are described below.

Under No Action Alternative, weapons-usable Pu material at ANL-W would continue to be stored in the material forms deemed most stable according to the ANL-W Plutonium ES&H Vulnerability Assessment Plan (October 31, 1994).

Radiological Impacts. The calculated annual dose to the average and maximally exposed members of the public from total site operation; the associated fatal cancer risks to these individuals from 50 years of operation; the dose to the population within 80 km (50 mi) from total site operation in the year 2030; and the projected number of fatal cancers in this population from 50 years of operation are presented in Table 4.2.3.9–1 under this alternative at INEL. The annual dose of 0.018 mrem to the MEI is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 4.4×10^{-7}. This activity would be included in a program to ensure that doses to the public are ALARA. The annual dose of 2.4 person-rem to the population would be within the limit in proposed 10 CFR 834. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.061. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

Under the No Action Alternative, shown in Table 4.2.3.9–2, the annual average dose to a noninvolved (No Action) site worker and the annual dose to the noninvolved (No Action) total site workforce would be 30 mrem and 220 person-rem, respectively, for total site operations. The associated risk of fatal cancer to the average worker from 50 years of total site operations would be 6.0×10^{-4} and the projected number of fatal cancers among all workers from 50 years of total size operations would be 4.4.

The average annual average dose to a worker involved in the No Action storage operations would be 26 mrem/yr with a total involved No Action workforce dose of 1.5 person-rem. The associated risk of latent fatal cancer to the average No Action involved worker from 50 years of operation would be 5.1×10^{-4} and the projected number of latent fatal cancers among the No Action involved workforce from 50 years of operation would be 0.029.

Hazardous Chemical Impacts. Hazardous chemical impacts on the public resulting from the normal operation under No Action at INEL are presented in Table 4.2.3.9–3. The hazardous chemical impacts from current site

Table 4.2.3.9–1. Potential Radiological Impacts to the Public During Normal Operation at Idaho National Engineering Laboratory—No Action and Storage Alternatives

Receptor	No Action		Upgrade		Consolidation		Collocation	
	Storage Facilities	Total Site	Storage Facilities	Total Site[a]	Storage Facility	Total Site[a]	Storage Facility	Total Site[a]
Annual Dose to the Maximally Exposed Individual Member of the Public[b]								
Atmospheric release pathway (mrem)	$1.4x10^{-5}$	0.018	$5.1x10^{-7}$	0.018	$1.6x10^{-6}$	0.018	$1.6x10^{-6}$	0.018
Drinking water pathway (mrem)	0	0	0	0	0	0	0	0
Total liquid release pathway (mrem)	0	0	0	0	0	0	0	0
Atmospheric and liquid release pathways combined (mrem)	$1.4x10^{-5}$	0.018	$5.1x10^{-7}$	0.018	$1.6x10^{-6}$	0.018	$1.6x10^{-6}$	0.018
Percent of natural background[c]	$4.1x10^{-6}$	$5.2x10^{-3}$	$1.5x10^{-7}$	$5.2x10^{-3}$	$4.7x10^{-7}$	$5.2x10^{-3}$	$4.7x10^{-7}$	$5.2x10^{-3}$
50-year fatal cancer risk	$3.5x10^{-6}$	$4.4x10^{-7}$	$1.3x10^{-11}$	$4.4x10^{-7}$	$4.0x10^{-11}$	$4.4x10^{-7}$	$4.0x10^{-11}$	$4.4x10^{-7}$
Population Dose Within 80 Kilometers for Year 2030[d]								
Atmospheric release pathway (person-rem)	$7.6x10^{-5}$	2.4	$3.2x10^{-6}$	2.4	$1.8x10^{-5}$	2.4	$1.8x10^{-5}$	2.4
Total liquid release pathway (person-rem)	0	0	0	0	0	0	0	0
Atmospheric and liquid release pathways combined (person-rem)	$7.6x10^{-5}$	2.4	$3.2x10^{-6}$	2.4	$1.8x10^{-5}$	2.4	$1.8x10^{-5}$	2.4
Percent of natural background[c]	$8.4x10^{-8}$	$2.7x10^{-3}$	$3.5x10^{-9}$	$2.7x10^{-3}$	$2.0x10^{-8}$	$2.7x10^{-3}$	$2.0x10^{-8}$	$2.7x10^{-3}$
50-year fatal cancers	$1.9x10^{-6}$	0.061	$7.2x10^{-8}$	0.061	$4.5x10^{-7}$	0.061	$4.5x10^{-7}$	0.061
Annual Dose to the Average Individual Within 80 Kilometers[e]								
Atmospheric and liquid release pathways combined (mrem)	$2.8x10^{-7}$	$8.9x10^{-3}$	$1.2x10^{-8}$	$8.9x10^{-3}$	$6.7x10^{-8}$	$8.9x10^{-3}$	$6.7x10^{-8}$	$8.9x10^{-3}$
50-year fatal cancer risk	$7.1x10^{-12}$	$2.2x10^{-7}$	$2.9x10^{-13}$	$2.2x10^{-7}$	$1.7x10^{-12}$	$2.2x10^{-7}$	$1.7x10^{-12}$	$2.2x10^{-7}$

[Text deleted.]

[a] Includes impacts from No Action facilities.The location of the MEI may be different under No Action than for the other alternatives. Therefore, the impacts may not be directly additive.

[b] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways as required by NESHAPS (40 CFR 61, Subpart H) under the CAA; 4 mrem per year from the drinking water pathway as required by the SDWA; and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[Text deleted.]

[c] The annual natural background radiation level at INEL is 338 mrem for the average individual; the population within 80 km in the year 2030 receives 90,800 person-rem.

[d] For DOE activities, proposed 10 CFR 834 (see 58 FR 16268) would generally limit the potential annual population dose to 100 person-rem from all pathways combined, and would require an ALARA program.

[Text deleted.]

[e] Obtained by dividing the population dose by the number of people projected to live within 80 km of the site in 2030 (269,000).

Source: Section M.2.

Table 4.2.3.9–2. Potential Radiological Impacts to Workers During Normal Operation at Idaho National Engineering Laboratory—Storage Alternatives

Receptor	No Action[a]	Upgrade[b]	Consolidation[b]	Collocation[b]
Involved Workforce[c]				
Average worker dose (mrem/yr)[d]	26	405	258	264
50-year risk of fatal cancer	5.1×10^{-4}	8.1×10^{-3}	5.2×10^{-3}	5.3×10^{-3}
Total dose (person-rem/yr)	1.5	18	24	25
50-year fatal cancers	0.029	0.36	0.48	0.50
Noninvolved Workforce[e]				
Average worker dose (mrem/yr)[d]	30	30	30	30
50-year risk of fatal cancer	6.0×10^{-4}	6.0×10^{-4}	6.0×10^{-4}	6.0×10^{-4}
Total dose (person-rem/yr)	219	219	219	219
50-year fatal cancers	4.4	4.4	4.4	4.4
Total Site Workforce[f]				
Dose (person-rem/yr)	220	237	243	244
50-year fatal cancers	4.4	4.8	4.9	4.9

[a] No Action storage worker doses are based on an average of 1994 to 1996 measured doses for 57 workers totaling 1.5 person-rem/year deep (assumed whole body) dose (ANL 1996a:1).

[b] Under the upgrade alternative, 81 involved workers (of which 42 are badged with dosimeters to monitor radiation exposure) would be required to operate the storage facilities, with an estimated additional 35 involved workers (3 badged) needed if Pu is transferred from RFETS and LANL. The impacts given in the Upgrade column include those associated with these additional workers. The number of involved badged workers for the Consolidation and Collocation Alternatives would be 92 and 95, respectively.

[c] The involved worker is a worker associated with operations of the proposed action. The maximum dose to an involved worker would be kept below 500 mrem per year. An effective ALARA program will ensure that exposure will be reduced to that level which is as low as reasonably achievable.

[d] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem per year (DOE 1992t); the site must make reasonable attempts to maintain worker doses below this level.

[e] The noninvolved worker is a worker onsite but not associated with operations of the proposed action. The projected number of noninvolved badged workers in 2005 is 7,337. The Noninvolved Workforce is equivalent to the site No Action workforce.

[f] The impact on the total site workforce is the summation of the involved worker impact and the noninvolved worker impact.

[Text deleted.]

Source: Section M.2.

Table 4.2.3.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation at Idaho National Engineering Laboratory—No Action (2005) and Storage Alternatives

	No Action	Upgrade		Consolidation		Collocation	
Receptor	Total Site[a]	Facilities[b]	Total Site[a]	Facility[b]	Total Site[a]	Facility[b]	Total Site[a]
Maximally Exposed Individual (Public)							
Hazard index[c]	1.5×10^{-2}	1.2×10^{-5}	1.5×10^{-2}	4.5×10^{-5}	1.5×10^{-2}	7.7×10^{-5}	1.5×10^{-2}
Cancer risk[d]	3.6×10^{-6}	5.9×10^{-8}	3.7×10^{-6}	5.9×10^{-8}	3.7×10^{-6}	5.9×10^{-8}	3.7×10^{-6}
Worker Onsite							
Hazard index[e]	0.22	3.7×10^{-4}	0.22	1.3×10^{-3}	0.22	1.9×10^{-3}	0.22
Cancer risk[f]	7.7×10^{-4}	1.2×10^{-5}	7.8×10^{-4}	1.2×10^{-5}	7.8×10^{-4}	1.2×10^{-5}	7.8×10^{-4}

[Text deleted.]

[a] Total=Sum of the No Action plus the contributions of the above activity.

[b] Contribution from the above activity only (that is, the amount of increase over the existing, No Action level at the site).

[c] Hazard index for MEI=Sum of Individual Hazard Quotients (noncancer health effects) for MEI.

[d] Cancer risk for MEI=(Emissions for 8-hr) x (0.286 [Converts concentrations to doses]) x (Slope Factor [SF]).

[e] Hazard index for workers=Sum of Individual Hazard Quotients (noncancer health effects) for workers.

[f] Cancer risk for workers=(Emissions for 8-hr) x (0.286 [Converts concentrations to doses]) x (0.237 [Fraction of year exposed]) x (0.571 [Fraction of lifetime working]) x (SF).

Source: Section M.3, Tables M.3.4–10 through M.3.4-13.

operations represent the baseline total site impacts for the various storage alternatives. The noncancer health effects expected and the risk of cancer due to the total chemical exposures were estimated for each site. Since the major releases due to normal operation at INEL would make up nearly all of the exposures to onsite workers and to the public in adjacent communities, contributions to the hazardous chemical concentrations from all other sources (for example, industrial operations) are considered negligible for purposes of risk calculations.

The HI to the MEI of the public at INEL resulting from normal operation under the No Action Alternative is 1.5×10^{-2}, and the cancer risk is 3.6×10^{-6}. The HI to the onsite worker is 0.22, and the cancer risk is 7.7×10^{-4}.

Facility Accidents. Under the No Action alternative, Pu would continue to be stored at INEL in existing facilities. These facilities currently operate in accordance with DOE Orders, which ensure that the risk to the public of prompt fatalities due to accidents or cancer fatalities due to operations will be minimized. The safety to workers and the public from accidents at existing facilities is also controlled by Technical Safety Requirements specified in detail in SARs or a Basis for Interim Operations document prepared and maintained specifically for a facility or process within a facility. Under these controls, any change in approved operations or to facilities would cause a halt in operations until it can be established that worker and public safety has not been compromised.

The *Final Safety Analysis Report for the Fuel Manufacturing Facility, Building 704* (ANL-IFR-57) and the *Final Safety Analysis Report of the Zero Power Plutonium Reactor Facility* (ANL-7471) at ANL-W analyzed a wide spectrum of design-basis accidents. These studies indicate that these facilities are low hazard based on the effects of design-basis accidents. However, these studies do not normally analyze the effects of severe accidents. An estimate of the effects of potential severe accidents in the existing storage vault at INEL can be derived from similar storage accidents that have been postulated for an upgraded storage facility. A severe consequence, low frequency accident for storage under the No Action Alternative would be a beyond design basis earthquake. If this accident were to occur, there would be an estimated 0.33 cancer fatalities in the offsite population within 80 km (50 mi). The estimated frequency of the earthquake with sufficient damage to cause a release is approximately 1.0×10^{-7} per year, which corresponds to a risk of 3.3×10^{-8} cancer fatalities per year. For the MEI and noninvolved worker, the corresponding impacts are 9.8×10^{-4} and 0.02 latent cancer fatalities, respectively, if the accident occurred. The risks would be 9.8×10^{-11} and 2.0×10^{-9} cancer fatalities per year. A potentially more frequent accident is penetration of the PCV caused by corrosion. If this accident were to occur, the estimated number of cancer fatalities in the offsite population would be 5.1×10^{-4} The estimated frequency of this accident is 0.064 per year, which corresponds to a risk to the offsite population of 3.3×10^{-5} cancer fatalities per year. For the MEI and noninvolved worker the corresponding impacts are 1.6×10^{-6} and 2.3×10^{-5} latent cancer fatalities, respectively, if the accident occurred. The risks would be 1.0×10^{-7} and 1.5×10^{-6} cancer fatalities per year.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the upgraded Pu storage alternative at INEL. The section describes the impacts from normal facility operations at INEL; this is followed by a description of impacts from facility accidents.

[Text deleted.]

Normal Operation. There would be no radiological releases during the modification or construction of storage facilities at INEL. Construction worker exposures to materials potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct exposures. The resulting doses and potential health effects on the public and workers at INEL are described below.

Radiological Impacts. Doses to the public from storage under the Upgrade Alternative are included in Table 4.2.3.9–1. Because facility and design features would improve under the Upgrade Alternative, these doses and resulting fatal cancers are surmised to be even smaller than those associated with storage under the No Action alternative. The dose to the MEI of the public due to annual operations under the Upgrade Alternative would be 5.1×10^{-7} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.3×10^{-11}. The impacts to the average individual would be less. As a result of operation under this alternative in the year 2030, the population dose would be 3.2×10^{-6} person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 7.2×10^{-8}.

The dose to the MEI from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 0.018 mrem. From 50 years of operations, the corresponding risk of fatal cancer to this individual would be 4.4×10^{-7}. These values are presented in Table 4.2.3.9–1. The impacts on the average individual would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operations in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 2.4 person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.061.

Doses to onsite workers from normal operations are given in Table 4.2.3.9–2. Included are involved workers directly associated with upgraded storage, workers who are not involved with the storage facilities, and the entire workforce at INEL. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operations are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemical impacts on the public and on the onsite worker resulting from the normal operations of the upgraded storage facilities at INEL are presented in Table 4.2.3.9–3. The impacts from total site operations, including the upgraded storage facilities, are also included in this table. Total site impacts, which include the No Action impact plus the storage impacts, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 1.2×10^{-5}, and the cancer risk is 5.9×10^{-8} as a result of operation of the upgraded storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation because exposures would be expected to remain the same. The total site operation, including the storage facilities, would result in an HI of 1.5×10^{-2} and a cancer risk of 3.7×10^{-6} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 3.7×10^{-4}, and the cancer risk is 1.2×10^{-5} as a result of operation of the upgraded storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation because exposures are expected to remain the same. The total site operation, including the storage facilities, would result in an HI of 0.22 and a cancer risk of 7.8×10^{-4} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. Modification of the existing Pu storage facilities at INEL may change the existing risks of accidents to workers and the public. ANL-W facilities would be modified and would be in compliance with DOE orders and other applicable regulations and standards. This may result in a reduction of risk compared to No Action.

A set of potential accidents have been postulated for upgraded existing storage facility for which there may be releases of Pu that may impact onsite workers and the offsite population. The impacts of potential accidents and the release of Pu would be dominated by the impacts associated with exposure to Pu. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.3.9–4. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.33 at INEL for the beyond design basis earthquake accident scenario with an estimated probability of 1.0×10^{-7} per year (that is, probability of severe earthquake occurring is estimated to be about 1.0×10^{-5}, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 1.6×10^{-6}, 4.9×10^{-9}, and 1.0×10^{-7}, respectively. The maximum population 50-year facility lifetime risk would be 1.6×10^{-3} (for example, one fatality in about 31,500 years) at INEL for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 5.0×10^{-6} and 7.5×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.3.9–4.

During normal operation at INEL, operation under the upgraded Pu storage alternative would result in impacts that are within applicable regulatory limits. Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Prior to construction of a new or modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Normal Operation. During normal operations, there would be only a negligible difference in radiological and hazardous chemical impacts if Pu from RFETS and LANL is included in the Upgrade Storage Alternative. Therefore, the impacts are essentially the same as presented in the previous subsection discussing the Upgrade Without RFETS or LANL Pu.

Facility Accidents. A set of potential accidents have been postulated for the incremental impacts for upgraded storage of LANL and RFETS Pu for which there may be releases of Pu that may impact onsite workers and the offsite population. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the general population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.3.9–5. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.037 at INEL for the beyond design basis earthquake accident scenario with an estimate probability of 1.0×10^{-7} per year (for example, probability of severe earthquake occurring is estimated to be about 1.0×10^{-5}, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-year facility lifetime risk

Table 4.2.3.9–4. Upgrade Without Rocky Flats Environmental Technology Site or Los Alamos National Laboratory Material Alternative—Accident Impacts at Idaho National Engineering Laboratory

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	1.7×10^{-7}	5.6×10^{-6}	1.1×10^{-8}	3.8×10^{-7}	3.7×10^{-6}	1.2×10^{-4}	6.0×10^{-4}
PCV breach by firearms discharge	9.9×10^{-9}	5.6×10^{-7}	6.6×10^{-10}	3.8×10^{-8}	2.2×10^{-7}	1.2×10^{-5}	3.5×10^{-4}
PCV penetration by corrosion	7.5×10^{-5}	2.3×10^{-5}	5.0×10^{-6}	1.6×10^{-6}	1.6×10^{-3}	5.1×10^{-4}	0.064
Vault fire	6.5×10^{-8}	0.013	3.3×10^{-9}	6.6×10^{-4}	1.1×10^{-6}	0.22	1.0×10^{-7}
Truck bay fire	4.0×10^{-9}	8.0×10^{-4}	2.7×10^{-10}	5.4×10^{-5}	8.9×10^{-8}	0.018	1.0×10^{-7}
Spontaneous combustion	7.9×10^{-12}	1.1×10^{-6}	5.3×10^{-13}	7.5×10^{-8}	1.7×10^{-10}	2.5×10^{-5}	7.0×10^{-7}
Explosion in the vault	4.6×10^{-8}	9.1×10^{-3}	2.5×10^{-9}	4.9×10^{-4}	8.2×10^{-7}	0.16	1.0×10^{-7}
Explosion outside of vault	4.0×10^{-11}	8.0×10^{-6}	2.7×10^{-12}	5.4×10^{-7}	8.9×10^{-10}	1.8×10^{-4}	1.0×10^{-7}
Nuclear criticality	2.0×10^{-11}	4.0×10^{-6}	1.5×10^{-12}	3.0×10^{-7}	4.8×10^{-11}	9.6×10^{-6}	1.0×10^{-7}
Beyond evaluation basis earthquake	1.0×10^{-7}	0.020	4.9×10^{-9}	9.8×10^{-4}	1.6×10^{-6}	0.33	1.0×10^{-7}
Expected risk[d]	7.5×10^{-5}	–	5.0×10^{-6}	–	1.6×10^{-3}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.1.1–5 and M.5.2.1.1–6 and the MACCS computer code.

from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 1.8×10^{-7}, 8.6×10^{-11}, and 1.1×10^{-8}, respectively. The maximum population 50-year facility lifetime risk would be 1.3×10^{-4} (for example, one fatality in about 38,500 years) at INEL for the PCV penetration by corrosion accident scenario with a probability of 6.6×10^{-3} per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 5.9×10^{-8} and 5.6×10^{-6} respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenario identified in Table 4.2.3.9–5. Table 4.2.3.9–5 also shows the combined expected risk for storage of existing Pu and the RFETS and LANL materials.

During normal operation at INEL, operation under the upgraded Pu storage alternative would result in impacts that are within applicable regulatory limits. Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Prior to construction of a new or modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Table 4.2.3.9–5. Upgrade With Rocky Flats Environmental Technology Site and Los Alamos National Laboratory Material Alternative—Accident Impacts at Idaho National Engineering Laboratory

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	1.2×10^{-7}	4.1×10^{-6}	1.3×10^{-9}	4.4×10^{-8}	2.9×10^{-6}	9.6×10^{-5}	6.0×10^{-4}
PCV breach by firearms discharge	7.2×10^{-9}	4.1×10^{-7}	7.8×10^{-11}	4.4×10^{-9}	1.7×10^{-7}	9.6×10^{-6}	3.5×10^{-4}
PCV penetration by corrosion	5.6×10^{-6}	1.7×10^{-5}	5.9×10^{-8}	1.8×10^{-7}	1.3×10^{-4}	3.9×10^{-4}	6.6×10^{-3}
Vault fire	5.8×10^{-9}	1.1×10^{-3}	4.8×10^{-11}	9.5×10^{-5}	1.0×10^{-7}	0.021	1.0×10^{-7}
Truck bay fire	2.9×10^{-9}	5.7×10^{-4}	3.1×10^{-11}	6.2×10^{-6}	6.7×10^{-8}	0.013	1.0×10^{-7}
Spontaneous combustion	2.9×10^{-11}	8.2×10^{-7}	3.1×10^{-13}	8.9×10^{-9}	6.7×10^{-10}	1.9×10^{-5}	7.0×10^{-7}
Explosion in the vault	6.9×10^{-10}	1.3×10^{-4}	7.5×10^{-12}	1.5×10^{-6}	1.6×10^{-8}	3.2×10^{-3}	1.0×10^{-7}
Explosion outside of vault	3.1×10^{-11}	6.2×10^{-6}	3.3×10^{-13}	6.7×10^{-8}	7.2×10^{-10}	1.4×10^{-4}	1.0×10^{-7}
Nuclear criticality	2.0×10^{-11}	4.0×10^{-6}	1.9×10^{-13}	3.9×10^{-8}	4.5×10^{-11}	8.9×10^{-6}	1.0×10^{-7}
Beyond evaluation basis earthquake	1.1×10^{-8}	2.2×10^{-3}	8.6×10^{-11}	1.7×10^{-5}	1.8×10^{-7}	0.037	1.0×10^{-7}
Expected risk[d]	5.6×10^{-6}	–	5.9×10^{-8}	–	1.3×10^{-4}	–	–
Combined expected risk[e]	8.1×10^{-5}	–	5.1×10^{-6}	–	1.7×10^{-3}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the incremental risks for the additional RFETS and LANL material over the lifetime of the plant.

[e] Combined expected risk for upgrade of existing storage and RFETS and LANL storage.

Note: All values are mean values.

Source: Calculated using Table 4.2.3.9–6.

Consolidation Alternative

Construct New Plutonium Storage Facility

This section includes a description of radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the new consolidated Pu storage facility at INEL. Normal operation of the consolidated storage facility would result in impacts that are within applicable regulatory limits.

[Text deleted.]

Normal Operation. There would be no radiological releases during the construction of a new consolidated Pu storage facility at INEL. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However,

concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects on the public and workers at INEL are described below.

Radiological Impacts. Radiological impacts on the public resulting from the normal operation of the new consolidated storage facility are presented in Table 4.2.3.9–1. The impacts from all site operations, including the new consolidated Pu storage facility, are also given in the table. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The dose to the MEI from annual storage facility operation would be 1.6×10^{-6} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 4.0×10^{-11}. The impacts on the average individual would be less. As a result of storage facility operation in the year 2030, the population dose would be 1.8×10^{-5} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 4.5×10^{-7}.

The dose to the MEI from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 0.018 mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 4.4×10^{-7}. The impacts on the average individual would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 2.4 person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.061.

Doses to onsite workers from normal operations are given in Table 4.2.3.9–2. Included are involved workers directly associated with the new consolidated storage facility, workers who are not involved with the new storage facility, and the entire workforce at INEL. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemical impacts on the public and on the onsite worker resulting from the normal operations of the new consolidated Pu storage facility at INEL are presented in Table 4.2.3.9–3. The impacts from all site operations, including the consolidated storage facility, are included in this table. Total site impacts, which include the No Action impact plus the consolidation alternative, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 4.5×10^{-5}, and the cancer risk is 5.9×10^{-8} as a result of operation of the new consolidated Pu storage facility in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures are expected remain the same. The total site operation, including the consolidated facility, would result in an HI of 1.5×10^{-2} and a cancer risk of 3.7×10^{-6} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 1.3×10^{-3}, and the cancer risk is 1.2×10^{-5} as a result of operation of the new consolidated Pu storage facility in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures are expected to remain the same. The total site operation, including the consolidated Pu storage facility, would result in an HI of 0.22 and a cancer risk of 7.8×10^{-4} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents have been postulated for consolidation of Pu for which there may be releases of Pu that may impact onsite workers and the offsite population. The accident

consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.3.9–6. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.36 at INEL for the beyond design basis earthquake accident scenario with an estimated probability of 1.0×10^{-7} per year (for example, probability of severe earthquake occurring is estimated to be about 1.0×10^{-5}, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 1.8×10^{-6}, 8.4×10^{-10}, and 1.1×10^{-7}, respectively. The maximum population 50-year facility lifetime risk would be 1.2×10^{-3} (for example, one fatality in about 42,000 years) at INEL for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 5.8×10^{-7} and 5.4×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.3.9–6.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities

Table 4.2.3.9–6. Consolidation Alternative Accident Impacts at Idaho National Engineering Laboratory

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	1.2×10^{-7}	4.1×10^{-6}	1.3×10^{-9}	4.4×10^{-8}	2.9×10^{-6}	9.6×10^{-5}	6.0×10^{-4}
PCV breach by firearms discharge	7.2×10^{-9}	4.1×10^{-7}	7.8×10^{-11}	4.4×10^{-9}	1.7×10^{-7}	9.6×10^{-6}	3.5×10^{-4}
PCV penetration by corrosion	5.4×10^{-5}	1.7×10^{-5}	5.8×10^{-7}	1.8×10^{-7}	1.2×10^{-3}	3.9×10^{-4}	0.064
Vault fire	5.7×10^{-8}	0.011	4.7×10^{-10}	9.3×10^{-4}	1.0×10^{-6}	0.20	1.0×10^{-7}
Truck bay fire	2.9×10^{-9}	5.7×10^{-4}	3.1×10^{-11}	6.2×10^{-6}	6.7×10^{-8}	0.013	1.0×10^{-7}
Spontaneous combustion	2.9×10^{-11}	8.2×10^{-7}	3.1×10^{-13}	8.9×10^{-9}	6.7×10^{-10}	1.9×10^{-5}	7.0×10^{-7}
Explosion in the vault	6.7×10^{-9}	1.3×10^{-3}	7.3×10^{-11}	1.5×10^{-5}	1.6×10^{-7}	0.031	1.0×10^{-7}
Explosion outside of vault	3.1×10^{-11}	6.2×10^{-6}	3.3×10^{-13}	6.7×10^{-8}	7.2×10^{-10}	1.4×10^{-4}	1.0×10^{-7}
Nuclear criticality	2.0×10^{-11}	4.0×10^{-6}	1.9×10^{-13}	3.9×10^{-8}	4.5×10^{-11}	8.9×10^{-6}	1.0×10^{-7}
Beyond evaluation basis earthquake	1.1×10^{-7}	0.021	8.4×10^{-10}	1.7×10^{-4}	1.8×10^{-6}	0.36	1.0×10^{-7}
Expected risk[d]	5.4×10^{-5}	–	5.8×10^{-7}	–	1.3×10^{-3}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.1.1–5 and M.5.2.1.1–6 and the MACCS computer code.

to workers close to the accident. Prior to construction of a new or modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

This section includes a description of radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the consolidation of Pu storage and collocation with HEU storage facilities at INEL. This storage would take place in a new Pu and HEU storage facility. Normal operation of the new collocated storage facility at INEL would result in impacts that are within applicable regulatory limits.

[Text deleted.]

Normal Operation. There would be no radiological releases during the construction of a new collocated storage facility at INEL. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored, as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects on the public and workers are described below.

Radiological Impacts. Radiological impacts on the public resulting from the normal operation of the new collocated storage facility at INEL are presented in Table 4.2.3.9–1. The impacts from all site operations, including the new storage facility, are also given in the table. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The dose to the MEI from annual storage facility operation would be 1.6×10^{-6} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 4.0×10^{-11}. The impacts on the average individual would be less. As a result of storage facility operation in the year 2030, the population dose would be 1.8×10^{-5} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 4.5×10^{-7}.

The dose to the MEI from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 0.018 mrem. From 50 years of operation, the corresponding risks of fatal cancer to this individual would be 4.4×10^{-7}. The impacts on the average individual would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 2.4 person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.061.

Doses to onsite workers from normal operations are given in Table 4.2.3.9–2. Included are involved workers directly associated with the new storage facility, workers who are not involved with the new storage facility, and the entire workforce at INEL. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemical impacts on the public and on the onsite worker resulting from the normal operations of the new consolidated Pu storage facility and collocation with HEU storage facilities at INEL are presented in Table 4.2.3.9–3. The impacts from all site operations, including the consolidation of Pu and collocation with HEU storage facilities are also included in this table. Total site impacts, which include the No Action impact plus the facility, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 7.7×10^{-5}, and the cancer risk is 5.9×10^{-8} as a result of operation of the new consolidation of Pu and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures are expected to remain the same. The total site operation, including the new facility, would result in an HI of 1.5×10^{-2} and a cancer risk of 3.7×10^{-6} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 1.9×10^{-3}, and the cancer risk is 1.2×10^{-5} as a result of operation of the new consolidation of Pu and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures are expected to remain the same. The total site operation, including the new facility would result in an HI of 0.22 and an cancer risk of 7.8×10^{-4} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents have been postulated for collocation of Pu and HEU for which there may be releases of Pu or HEU that may impact onsite workers and the offsite population. The consequences and risks of potential accidents that release both Pu and HEU would be bounded by the impacts associated with Pu. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the general population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.3.9–7. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.36 at INEL for the beyond design basis earthquake accident scenario with an estimated probability of 1.0×10^{-7} per year (for example, probability of severe earthquake occurring is estimated to be about 1.0×10^{-5}, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 1.8×10^{-6}, 8.4×10^{-10}, and 1.1×10^{-7}, respectively. The maximum population 50-year facility lifetime risk would be 1.2×10^{-3} (for example, one fatality in about 42,000 years) at INEL for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 5.8×10^{-7} and 5.4×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.3.9–7.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Prior to construction of a new or modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Material

If the strategic reserve and weapons R&D is not included, the impacts on the public and on workers from the accident-free storage activities would be reduced in proportion to the decrease in the amount of material stored. The impacts from total site operations would decrease slightly. This subalternative applies to the Upgrade With

Table 4.2.3.9–7. Collocation Alternative Accident Impacts at Idaho National Engineering Laboratory

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	1.2×10^{-7}	4.1×10^{-6}	1.3×10^{-9}	4.4×10^{-8}	2.9×10^{-6}	9.6×10^{-5}	6.0×10^{-4}
PCV breach by firearms discharge	7.2×10^{-8}	4.1×10^{-7}	7.8×10^{-11}	4.4×10^{-9}	1.7×10^{-7}	9.6×10^{-6}	3.5×10^{-4}
PCV penetration by corrosion	5.4×10^{-5}	1.7×10^{-5}	5.8×10^{-7}	1.8×10^{-7}	1.2×10^{-3}	3.9×10^{-4}	0.064
Vault fire	5.7×10^{-8}	0.011	4.7×10^{-10}	9.3×10^{-4}	1.6×10^{-6}	0.26	1.0×10^{-7}
Truck bay fire	2.9×10^{-9}	5.7×10^{-4}	3.1×10^{-11}	6.2×10^{-6}	6.7×10^{-8}	0.013	1.0×10^{-7}
Spontaneous combustion	2.9×10^{-11}	8.2×10^{-7}	3.1×10^{-13}	8.9×10^{-8}	6.7×10^{-10}	1.9×10^{-5}	7.0×10^{-7}
Explosion in the vault	6.7×10^{-9}	1.3×10^{-3}	7.3×10^{-10}	1.5×10^{-5}	1.6×10^{-7}	0.031	1.0×10^{-7}
Explosion outside of vault	3.1×10^{-11}	6.2×10^{-6}	3.3×10^{-13}	6.7×10^{-8}	7.2×10^{-10}	1.4×10^{-4}	1.0×10^{-7}
Nuclear criticality	2.0×10^{-11}	4.0×10^{-6}	1.9×10^{-13}	3.9×10^{-8}	4.5×10^{-11}	8.9×10^{-6}	1.0×10^{-7}
Beyond evaluation basis earthquake	1.1×10^{-7}	0.021	8.4×10^{-10}	1.7×10^{-4}	1.8×10^{-6}	0.36	1.0×10^{-7}
Expected risk[d]	7.5×10^{-5}	–	5.8×10^{-7}	–	1.3×10^{-3}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.1.1–5 and M.5.2.1.1–6 and the MACCS computer code.

All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. The risks due to accidents would also tend to be lower.

Phaseout

Normal Operation. A phaseout of existing Pu storage facilities at INEL would reduce the impacts from radiological and chemical releases and exposures to levels slightly below the No Action levels. All workers involved in the removal of the Pu from INEL would be monitored to assure that their doses remain within regulatory limits and as low as reasonably achievable.

Facility Accidents. The phaseout operation will be conducted in accordance with DOE 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. For current operations in the facility that would be phased out, the safety of workers and the public from accidents is controlled by Technical Safety Requirements that are specified in SARs or Basis for Interim Operations documents that have been prepared for the facility. Prior to initiating phaseout, the potential for accidents that could impact workers and the public will be assessed and, if necessary, applicable existing safety documentation will be modified to ensure safety for workers and the public.

4.2.3.10 Waste Management

This section summarizes the impacts on waste management at INEL under No Action and for each of the long-term storage alternatives to include the phaseout of Pu storage. There is no spent nuclear fuel or HLW associated with Pu or HEU storage. Table 4.2.3.10–1 lists the projected sitewide waste generation rates and treatment, storage, and disposal capacities under No Action for 2005. Projections for No Action were derived from the most recent available environmental data, with appropriate adjustments made for those changing operational requirements where the volume of wastes generated is identifiable. The projection does not include wastes from future, yet uncharacterized, environmental restoration activities. The projections for No Action could change significantly depending on the decisions resulting from the PEIS on waste management being prepared by the Department. Table 4.2.3.10–2 provides the estimated incremental operational waste volumes projected to be generated at INEL as a result of the various storage alternatives prior to treatment. Some of the waste values described in this section are different than the waste values in the table. For those values that differ (for example, LLW), the table gives waste generated pre-treatment values and the text discusses post-treatment values (indicated as after treatment and volume reduction). The waste volumes generated from the various storage alternatives and the resultant waste effluent used for the waste impact analysis are shown in Section E.3.1. Facilities that would support the storage of Pu and HEU would treat and package all waste generated into forms that would enable staging and/or disposal in accordance with RCRA and other applicable statutes. Depending in part on decisions in waste-type-specific RODs for the Waste Management PEIS, wastes could be treated and disposed of onsite or at regionalized or centralized DOE sites. For the purposes of analyses only, this PEIS assumes that TRU and mixed TRU waste would be treated onsite to the current planning-basis WIPP WAC, and shipped to WIPP for disposal. This PEIS also assumes that LLW, mixed LLW, hazardous, and nonhazardous wastes would be treated and disposed of in accordance with current site practice.

Preferred Alternative: No Action Alternative

Under this alternative, INEL would receive spent nuclear fuel from numerous offsite generators/storage locations, and high-level, TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed from the missions outlined in Section 3.4. INEL's focus would be to continue the restoration of priority sites and the stabilization of other sites. By the year 2010, much of the existing wastes at INEL would have been treated and disposed of or stored in compliance with existing regulations. The waste treatment activities that are planned to be still in operation are the calcination of liquid HLW and LLW after completion of the processing of special fuels and residuals at the ICPP, the retrieval and repackaging of buried TRU waste, and stabilization of spent nuclear fuel for long-term storage. Under No Action, INEL would continue to store its inventory of Pu and to treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities.

Spent nuclear fuel would be managed in accordance with the ROD published on June 1, 1995 (60 FR 28680) from the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE/EIS-0203-F) as amended on March 8, 1996 (61 FR 9441). According to the ROD, INEL would ship its existing inventory of aluminum-clad spent nuclear fuel to SRS. In addition, INEL would receive non-aluminum-clad spent nuclear fuel from the Navy, Hanford, SRS, West Valley Demonstration Project, foreign research reactors, universities, and other generators or storage sites. The following INEL spent nuclear fuel projects will be implemented as a result of the ROD: Increased Rack Capacity for Building 666, Dry Fuel Storage Facility, and Expended Core Facility Dry Cell Project. Decisions regarding other ongoing or planned projects, as it was with the Electrometallurgical Process Demonstration (61 FR 25647), would be made in the future pending further project definition, funding priorities, and appropriate review under NEPA. TRU waste already packaged to current planning-basis WIPP WAC would either be stored or would have been shipped. Mixed waste would have been treated and disposed of according to the INEL Site Treatment Plan, which was developed to comply with the *Federal Facility Compliance Act*. Solid LLW would continue to be buried at the onsite RWMC. Under No Action, the processing of legacy wastes would require new facilities since the necessary treatment, storage, and disposal facilities either do not exist or are nearing capacity.

Table 4.2.3.10–1. Projected Spent Nuclear Fuel and Waste Management Under No Action (2005) at Idaho National Engineering Laboratory

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Spent Nuclear Fuel	None (offsite receipts are expected)	Stabilization	Being designed	Pools, dry, casks	Planned[a]	To HLW Program	NA
High-Level							
Liquid	538	Calcine	470[b]	Tanks	13,361[c]	NA	NA
Solid	192[d]	Debris treatment filter leach	238[e]	Bins	7,114[f]	To HLW Program	NA
Transuranic							
Liquid	None	None	None	None	None	NA	NA
Solid	3.5	30,534[g]	Planned	TRU storage facility	206,000[h]	WIPP or alternate facility	NA
Low-Level							
Liquid	None[i]	Evaporation, fractionation, calcification	11,600[j]	Tanks	See HLW	NA	NA
Solid	7,200	Incineration, compact	33,423[k]	None	None	Subsurface disposal	180,000[l]
Mixed Low-Level							
Liquid	4	Incineration, stabilize	Included in LLW	RCRA Facility	None	None	None
Solid	170	Incineration, stabilize	Included in LLW	RCRA Facility	114,600[m]	None	None
Hazardous							
Liquid	Included in solid	Offsite	None	Drums, RCRA facility	Included in solid[n]	Offsite	NA
Solid	1,200	Offsite	None	RCRA facility	64[n]	Offsite	NA

Table 4.2.3.10–1. Projected Spent Nuclear Fuel and Waste Management Under No Action (2005) at Idaho National Engineering Laboratory—Continued

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Nonhazardous (Sanitary)							
Liquid	Included in solid	Evaporation	Planned[d]	Ponds	Planned[d]	None	None
Solid	52,000	None	Planned[d]	None	None	Landfill	1,830,000 to 3,060,000
Nonhazardous (Other)							
Liquid	None	None	NA	NA	NA	NA	NA
Solid	Included in sanitary	None	NA	None	None	Onsite landfill	Included in sanitary

[a] Long-term storage and capacity planned pending implementation of ROD from *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (60 FR 28680).
[b] New Waste Calcining Facility.
[c] ICPP tank farm.
[d] No new waste. Produced in calcining existing liquid waste.
[e] ICPP Debris Treatment, HEPA Filter Leach.
[f] Calcine bin sets.
[g] ICPP Debris Treatment, HEPA Filter Leach, Advanced Mixed Waste Treatment Project, Remote Treatment Facility.
[h] ANL-W, New Waste Calcining Facility, RWMC.
[i] No new waste. Process wastewater from legacy waste.
[j] Portable water treatment unit, Waste Experimental Reduction Facility, New Waste Calcining Facility, Advanced Mixed Waste Treatment Project.
[k] ICPP Debris Treatment, HEPA Filter Leach, New Waste Calcining Facility, Lead Treatment, Sodium Processing Facility, TAN Cask Dismantlement, Waste Experimental Reduction Facility, Advanced Mixed Waste Treatment Project.
[l] RWMC, 67,000 m^3, expansion capacity potentially available.
[m] RWMC, TAN, PBF, ICPP, ANL-W.
[n] ANL-W, Hazardous Waste Storage Facility at the central facilities area.

Note: NA=not applicable.

Source: 60 FR 28680; DOE 1995i; DOE 1995j; DOE 1995v; DOE 1995gg; DOE 1995kk; IN DOE 1995d.

Table 4.2.3.10–2. Estimated Annual Generated Waste Volumes at Idaho National Engineering Laboratory—No Action (2005) and Net Incremental for Storage Alternatives

Category	No Action[a] (m^3)	Upgrade: Without RFETS or LANL Material[b] (m^3)	Upgrade: With RFETS and LANL Material[b] (m^3)	Consolidation[b] (m^3)	Collocation[b] (m^3)	Phaseout (m^3)
Transuranic						
Liquid	None	0.004[c]	0.004[c]	0.02[c]	0.02[c]	0
Solid	3.5	2	2	10	10	0
Mixed Transuranic						
Liquid	None	0	0	0	0	0
Solid	Included in TRU	1	1	4	4	0
Low-Level						
Liquid	None	0.79[c]	0.79[c]	2[c]	2.1[c]	0
Solid	7,200	500	500	1,260	1,300	0
Mixed Low-Level						
Liquid	4	-0.015	0.14	0.2	0.2	0
Solid	170	27	27	65	66	0
Hazardous						
Liquid	Included in solid	0.15	1.3	2	2	0
Solid	1,200	1	1	2	2	0
Nonhazardous (Sanitary)						
Liquid	Included in solid	7,600	10,300	65,900	86,800	0
Solid	52,000	240	346	1,320	1,720	0
Nonhazardous (Other)						
Liquid	None	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	0
Solid	Included in sanitary	310[d]	440[d]	1,600[d]	2,100[d]	0

[a] The No Action Waste volumes are from Table 4.2.3.10–1.

[b] Waste volumes for storage alternatives are found in Section E.3.1 (Tables E.3.1.1–2, E.3.1.1–6, E.3.1.2–4, and E.3.1.3–4). Waste effluents (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in these tables.

[c] Liquid TRU and LLW would be treated and solidified prior to disposal.

[d] Recyclable wastes.

The Pu addressed in this PEIS is limited to materials currently stored within protected vaults and gloveboxes, and additional materials within process lines and process equipment associated with Pu storage and surveillance facilities. The Pu facilities have been used to conduct Pu processing operations such as Pu purification, Pu recovery, oxide production, metal production, and parts fabrication. The Pu facilities have also been used for receipt and large-scale storage of onsite and offsite Pu, uranium scrap, and product materials. Under No Action, INEL would not be able to maintain the inventory of Pu scrap and metal in a state that provides for long-term storage while awaiting a decision for future disposition. Modifications to the facilities would be required to meet current regulations. Maintenance, assay, packaging, and monitoring of the inventory would produce TRU, low-level, hazardous, and nonhazardous wastes. These wastes would be treated, stored, and disposed of in compliance with existing regulations.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

The upgrading of the existing ANL-W storage facility for the continued storage of Pu would have a small impact on existing ANL-W and INEL waste management activities. Construction waste volumes as presented in Table E.3.1.1–2 would have minimal impact on ANL-W and INEL waste management activities. Waste generated during construction would consist of wastewater and solid nonhazardous and hazardous wastes. Nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous waste would be shipped offsite to commercial RCRA-permitted treatment and disposal facilities. Operational waste volumes as shown in Table 4.2.3.10–2 would increase slightly due to increased surveillance activities over No Action.

Following treatment and volume reduction of TRU waste, approximately 1 m^3 (1.3 yd^3) of solid TRU waste and 1 m^3 (1.3 yd^3) of solid mixed TRU waste from damaged PCVs and contaminated glovebox panels, windows, and gaskets would need to be treated and packaged to meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment to WIPP (depending on decisions made in the ROD associated with the supplemental EIS for the proposed continued phased development of WIPP for disposal of TRU waste), the TRU waste would be stored in above-grade storage facilities in the INEL RWMC and processed in the planned Advanced Mixed Waste Treatment Project. One additional truck shipment every 4 years or, if applicable, one regular train shipment every 9 years or one dedicated train shipment every 25 years would be required to transport this waste to WIPP.

After treatment and volume reduction, approximately 250 m^3 (327 yd^3) of LLW from solidified liquid LLW (such as decontamination solutions), protective clothing, HEPA filters, glovebox gloves, and decontamination equipment and materials would be packaged at the existing Waste Experimental Reduction Facility and would require disposal in the RWMC. Assuming a land usage of 6,200 m^3/ha (3,300 yd^3/acre), this would require 0.04 ha/year (0.1 acre/yr) of LLW disposal area.

Contaminated shielding and cleaning materials would be the major contributors to the 0.015 m^3 (4 gal) of liquid and 27 m^3 (35 yd^3) of solid mixed LLW. This small amount of mixed LLW could be treated and disposed of in accordance with the INEL Site Treatment Plan through the use of existing and planned facilities.

The 0.15 m^3 (40 gal) of liquid hazardous wastes such as lubricants, cleaning solvents, paint, and lube oil and 1 m^3 (1.3 yd^3) of solid hazardous wastes such as lead packing, wipes, and solid materials contaminated with oils, lubricants, and cleaning solvents would have a minimal impact on waste management activities at INEL. While awaiting shipment to an offsite RCRA-permitted treatment and disposal facility, the INEL Hazardous Waste Storage Facility has adequate capacity to handle this increase.

Approximately 7,600 m^3 (2,010,000 gal) of liquid nonhazardous wastes to include sanitary, utility, and process wastewaters, and cooling system blowdown could be handled by the existing Industrial Waste Pond and ANL-W sewage lagoons. After volume reductions, 120 m^3 (157 yd^3) of solid nonhazardous wastes such as clean non-Pu metals, packing materials, office trash, defective and damaged equipment, and industrial waste from utility and maintenance operations would be sent to the existing sanitary/industrial landfill on the INEL site.

Upgrade With All or Some Rocky Flats Environmental Technology Site and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Construction and operation of an upgraded Pu storage facility that would accommodate material from RFETS and LANL would have the same waste management impacts as the same Upgrade Without RFETS or LANL material for all but nonhazardous wastes. The generation of TRU, mixed TRU, and LLW would be the same during operations. While the liquid mixed low-level and hazardous waste generated during operations is slightly higher, it is not significantly different. Therefore, the impacts would be similar.

Approximately 10,300 m^3 (2,720,000 gal) of liquid nonhazardous wastes to include sanitary, utility, and process wastewaters and cooling system blowdown can be handled by the existing Industrial Waste Pond and ANL-W sewage lagoons. After volume reduction, 173 m^3 (226 yd^3) of solid nonhazardous wastes such as clean non-Pu metals, packing materials, office trash, defective and damaged equipment, and industrial waste from utility and maintenance operations would be sent to the existing sanitary/industrial landfill on the INEL site.

Distributing the RFETS and LANL Pu to more than one site would reduce the operational waste volumes. The decrease would be proportional to the amount of material.

Consolidation Alternative

Construct New Plutonium Storage Facility

Construction and operation of a consolidated Pu storage facility would have an impact on existing ANL-W waste management activities by increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations. The types of operational wastes from the consolidated Pu storage facility would be same as those from the upgraded facility, but the quantity would change, as shown in Table 4.2.3.10–2.

After treatment and volume reduction of TRU waste, approximately 5 m^3 (7 yd^3) of solid TRU waste and 4 m^3 (5 yd^3) of mixed TRU waste from leaded gloves, windows, and contaminated Pb shielding would be treated and packaged to meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment to WIPP (depending on decisions resulting from the supplemental EIS noted earlier), the TRU and mixed TRU waste could be stored in above-grade storage facilities in the INEL RWMC and processed in the planned Idaho Waste Processing Facility. One additional truck shipment per year or, if applicable, one regular train shipment every 2 years, or one dedicated train shipment every 6 years, would be required to transport these wastes to WIPP.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW would require disposal in the RWMC. This would require approximately 0.1 ha/year (0.3 acre/yr) of LLW disposal area at the RWMC. The 0.2 m^3 (50 gal) of liquid mixed LLW and 65 m^3 (85 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the INEL Site Treatment Plan through the use of existing and planned facilities. The 2 m^3 (476 gal) of liquid hazardous waste and 2 m^3 (3 yd^3) of solid hazardous wastes would have minimal impact on waste management activities at INEL, as there is adequate storage capacity as noted earlier in the upgrade alternative.

The treatment of 65,900 m^3 (17,400,000 gal) of liquid nonhazardous wastes could use existing sanitary wastewater treatment systems, but the construction of utility and process wastewater treatment systems would be required. After volume reduction, 660 m^3 (863 yd^3) of solid nonhazardous wastes would require disposal at the existing sanitary/industrial landfill on the INEL site.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction and operation of a consolidated Pu storage facility collocated with HEU storage would have an impact on existing INEL waste management activities, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to a commercial RCRA-permitted treatment and disposal facility. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations. Because there is no TRU or mixed TRU waste associated with HEU storage, the impacts from TRU and mixed TRU wastes are identical to those identified in the Consolidated Pu Storage Alternative. The sources of waste are similar to those of the upgraded Pu storage facility, except the source of radioactive contamination from the HEU storage is uranium. Operational waste volumes are shown in Table 4.2.3.10–2.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of solid LLW contaminated with Pu and 20 m^3 (26 yd^3) contaminated with uranium would require disposal in the RWMC. This would require approximately 0.1 ha/yr (0.3 acre/yr) of LLW disposal area. The 0.2 m^3 (55 gal) of liquid mixed LLW and 66 m^3 (86 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the INEL Site Treatment Plan through the use of existing and planned facilities. The 2 m^3 (528 gal) of liquid hazardous wastes and 2 m^3 (3 yd^3) of solid hazardous wastes would have a minimal impact on waste management activities at INEL, as there is adequate storage capacity as noted earlier in the upgrade alternative.

The treatment of 86,800 m^3 (22,900,000 gal) of liquid nonhazardous wastes could use existing sanitary wastewater treatment systems, but the construction of utility and process wastewater treatment systems would be required. After volume reduction, 860 m^3 (1,120 yd^3) of solid nonhazardous wastes would require disposal at the existing sanitary/industrial landfill on the INEL site.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

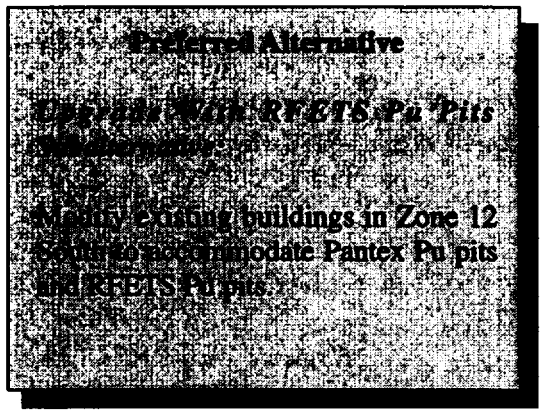
The exclusion of strategic reserve and weapons R&D materials would reduce the amount of operational waste volumes shown in Table 4.2.3.10–2 for the Upgrade with All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. The decrease would be proportional to the amount of material excluded.

Phaseout

The phaseout of Pu storage would have no impact on INEL waste management activities. The quantities of waste would not decrease until D&D in which Pu is stored was completed.

4.2.4 PANTEX PLANT

A listing of the proposed long-term storage alternatives, subalternatives, and related actions, including the No Action Alternative, at Pantex is provided below. The potential impacts of implementing these alternatives and related actions at Pantex are described in the following sections: 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, and waste management. The specific long-term storage alternatives proposed for Pantex are the Preferred Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative.



The Preferred Alternative for Pantex is to store those surplus pits currently stored at Pantex, and pits from RFETS at Pantex pending disposition. This alternative includes storing strategic reserve pits at Pantex in accordance with the Preferred Alternative for the Stockpile Stewardship and Management PEIS. The Preferred Alternative would modify the existing buildings 12-66 and 12-82 and utilize buildings 12-116 and 12-117 in Zone 12 South. Pits from RFETS would be moved beginning in 1997. RFETS pits would be transported to Pantex as described in Section 4.4, repackaged in AL-R8 containers (if AT-400A containers are unavailable), and placed in storage in Zone 4 West. The storage of the RFETS pits would be similar to pits currently in storage from disassembly operations at Pantex. Placing the RFETS pits in Zone 4 would not exceed the 20,000 pits storage analyzed in the Pantex EIS.

The Preferred Alternative for storage identified in this PEIS calls for the transfer of Pu pits from RFETS to Pantex with storage of surplus pits continuing until disposition. Pits to be transferred would be packaged in FL (Type B) containers at RFETS before shipment and, upon receipt at Pantex, would be repackaged into AL-R8 containers in Zone 12 South and placed into storage in Zone 4 West pending availability of AT-400A containers and relocation to upgraded storage facilities in Zone 12 South. The environmental analysis of intersite transportation for shipment of the RFETS Pu to Pantex is given in Section 4.4 of this PEIS for both workers and the public. Storage of Pantex pits at Zone 4 West is analyzed in the Pantex EIS; transportation from Zone 4 to Zone 12 and repackaging of the pits from AL-R8 to AT-400A containers, storage, and intrasite transportation of RFETS pits at Zone 4 West are described in Appendix Q.

The data for the Upgrade With RFETS Pu and LANL Pu Subalternative was based on a storage vault with a capacity of 40,000 positions. The data for the Upgrade Without RFETS Pu or LANL Pu Subalternative was based on a storage vault with a capacity of approximately 25,000 positions including about 20,000 positions for surplus pits and about 5,000 positions for the strategic reserve. Because the Preferred Alternative would remove only the pits from RFETS for storage at Pantex, and not all the RFETS Pu and LANL Pu, the storage of 20,000 pits analyzed in the Pantex EIS would not be exceeded.

Proposed Storage Activities at Pantex Plant

- **No Action Alternative:** Continue to store Pantex Pu material within the scope of this PEIS (which consists entirely of pits) in Zone 4 Magazines in stabilized form pursuant to DNFSB Recommendation 94-1.

- **Upgrade Alternative:** There are three subalternatives under this storage alternative.

  - ***Upgrade With RFETS Pu Pits Subalternative (Preferred Alternative):*** Modify existing buildings in Zone 12 South to accommodate Pantex Pu pits and RFETS Pu pits.

  - ***Upgrade Without RFETS Pu or LANL Pu Subalternative:*** Modify existing buildings in Zone 12 South to accommodate Pantex Pu material.

  - ***Upgrade With All or Some RFETS Pu and LANL Pu Subalternative:*** Modify existing buildings in Zone 12 South to accommodate Pantex, RFETS, and LANL Pu material.

- **Consolidation Alternative:** Two options to accommodate all Pu material within the scope of this PEIS: Construct a new facility and modify existing buildings in Zone 12 South; or construct a larger new facility in Zone 12 South.

- **Collocation Alternative:** Construct a new facility in Zone 12 South to accommodate all Pu and HEU material within the scope of this PEIS.

- **Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials:** Facility and other resource requirements would be smaller than the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative.

- **Phaseout:** Pantex Pu material within the scope of this PEIS would be moved out of Zone 4 to the Consolidation or Collocation site (located at another DOE site) or to disposition (for surplus Pu).

4.2.4.1 Land Resources

No Action Alternative

Under this alternative, Pantex Pu material (which consists entirely of pits) would continue to be stored at the current storage location in Zone 4 Magazines pursuant to DNFSB Recommendation 94–1. The ongoing (no new action) activities conform with present and future land-use plans, policies, and controls. A description of No Action facilities and processes is presented in Section 2.2.4. Therefore, no effects to land resources would be anticipated at Pantex beyond those of existing and future activities that are independent of the proposed action.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Pu storage upgrade at Pantex consists of existing facilities and the expansion of one facility and associated ramp within Zone 12 South to accommodate Pantex Pu and RFETS pit material. Land area requirements would be 0.18 ha (0.45 acres) during construction of which 0.1 ha (0.25 acres) would be used during operations. However, the facility would be situated on previously disturbed land. Buffer zone distances would be based on technical, safety, and security considerations.

Land Use. Construction and operation of the proposed upgrade would conform with the current *Pantex Site Development Plan,* which includes as part of its master plan the Fissile Materials Storage Facility in Zone 12 (PX DOE 1995g:8,11). The proposal would not change existing land use. As discussed in Section 4.2.4.8, in-migration of workers would be anticipated only for operations. However, since projected housing vacancies would be sufficient to accommodate the slight population growth, no indirect effects to offsite lands would be expected.

The storage upgrade would not affect other site land uses. As discussed in Section 3.5.1, there would be no onsite effects to prime farmland. The upgrade would not be in conflict with the city of Amarillo's land-use plans, policies, and controls since they do not address Pantex.

Visual Resources. The proposed visual environment would be compatible with the existing industrialized landscape character. The current VRM Class 5 designation of Zone 12 would remain.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Land area requirements during construction and operation for the proposed Pu storage facility at Pantex with all or some RFETS Pu and LANL Pu would be equal to that for Upgrade With RFETS Pu Pits Subalternative because the upgrade without would accommodate both subalternatives. Direct and indirect effects on land resources during construction and operation would be equal to that for Upgrade With RFETS Pu Pits Subalternative. [Text deleted.]

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

This option would include the modification of existing buildings and construction of a new facility in Zone 12 South. Land area requirements would be 60.5 ha (149 acres) during construction of which 58 ha (143 acres) would be used during operations. However, the construction laydown area and storage facility would be situated on previously disturbed land and would not create any newly disturbed area. A buffer zone would be provided between facilities and the Pantex boundary.

Land Use. Construction and operation of this storage upgrade would be consistent with the site master plan as included within the current *Pantex Site Development Plan*, which identifies a Fissile Materials Storage Facility in Zone 12 (PX DOE 1995g:8,11). [Text deleted.] As discussed in Section 4.2.4.8, vacancies in the projected housing stock would be sufficient to accommodate the slight population growth due to the in-migration of construction and operational workers. Therefore, no indirect effects to offsite land use would be anticipated.

Construction and operation of this storage upgrade option would not affect other site land uses. There would be no onsite effects to prime farmland. This upgrade option would not be in conflict with the city of Amarillo's land-use plans, policies, and controls since they do not address Pantex.

Visual Resources. [Text deleted.] The proposed activities would be compatible with the existing industrialized landscape character. The current VRM Class 5 designation of Zone 12 would not change.

Construct New Plutonium Storage Facility

All the Pu would be stored at a new storage facility to be constructed in the north portion of Zone 12 South at Pantex. Land area requirements would be 58.5 ha (144 acres) during construction of which 56 ha (138 acres) would be used during operations. However, the construction laydown area and stand-alone storage facility would be entirely situated on previously disturbed land and would not create any newly disturbed area. A buffer zone would be provided between operations and the Pantex site boundary. Pu storage in existing DOE storage facilities would be phased out.

Land Use. The proposal would conform with the current *Pantex Site Development Plan,* which includes the Fissile Materials Storage Facility in Zone 12 (PX DOE 1995g:8,11) as part of its master plan. [Text deleted.] As discussed in Section 4.2.4.8, available projected housing vacancies would accommodate the population growth attributed to the in-migration of construction and operational workers. Therefore, no indirect effects to offsite land use would be anticipated.

Construction and operation would not affect other site land uses or prime farmland. This upgrade option would be consistent with the city of Amarillo's land-use plans, policies, and controls.

Visual Resources. [Text deleted.] The proposed visual environment would be compatible with the existing industrialized landscape character. The current VRM Class 5 designation of Zone 12 would remain.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The collocation alternative would store Pu and HEU within the scope of this PEIS at a new facility to be constructed in Zone 12 South at Pantex. Pu and HEU storage in existing DOE facilities would be phased out. Land area requirements would be 89.5 ha (221 acres) during construction of which 87 ha (215 acres) would be used during operations. However, the construction laydown area and storage facility would be situated on previously disturbed land and would not create any newly disturbed area. A buffer zone would be provided between facilities and the Pantex site boundary.

Land Use. Construction and operation would conform with the current *Pantex Site Development Plan,* which includes the Fissile Materials Storage Facility in Zone 12 (PX DOE 1995g:8,11) as part of its master plan. [Text deleted.] As discussed in Section 4.2.4.8, projected housing vacancies would be sufficient to accommodate the increase in demand for housing units due to the in-migration of construction and operational workers. Therefore, no indirect effects to offsite land use would be anticipated.

Construction and operation would not affect other site land uses or prime farmland. This Collocation Alternative would be consistent with the city of Amarillo's land-use plans, policies, and controls.

Visual Resources. Potential impacts from construction and operation to visual resources would be similar to those of the Consolidation Alternative.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, land effects during construction and operation would be almost the same in extent and magnitude to the No Action Alternative, Upgrade Alternative, Consolidation Alternative, and Collocation Alternative because the facility would be almost the same. However, because the smaller quantity of material would require smaller facilities, it is likely that less land area would be disturbed during construction and used during operations. [Text deleted.]

Phaseout

No new construction or upgrade of existing facilities would occur under phaseout of the Pu storage mission. Pantex Pu material would be moved out of Pantex to the consolidation or collocation site or disposition. Potential impacts to visual resources could occur if facilities are not maintained.

[Text deleted.]

4.2.4.2 Site Infrastructure

Pantex would be capable of supporting any of the storage alternatives without major modifications to the existing infrastructure. A comparison of site infrastructure and facilities resource needs for the storage alternatives is shown in Table 4.2.4.2–1. Neither the addition of all or part of the material currently stored at RFETS and LANL nor the removal of strategic reserve and weapons R&D material would require major site infrastructure changes at Pantex.

No Action Alternative

Because of the downsized production mission after nuclear weapons stockpile dismantlement actions are complete, a considerable reduction in site infrastructure requirements is expected to occur. As a result, Pantex can accommodate the No Action Alternative using the site infrastructure that is currently in place at the site.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Construction to upgrade the existing storage facility to accommodate long-term storage of Pu currently at Pantex and RFETS pits would not affect the site infrastructure. Data for construction are presented in Appendix C. As shown in Table 4.2.4.2–1, operating the upgraded facility would not significantly affect the site infrastructure. All infrastructure requirements are within site capacities.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Construction to upgrade the existing storage facility to accommodate long-term storage of existing quantities of Pantex, RFETS Pu, and LANL Pu material would have minimal impacts on the site infrastructure. Data for construction and operations presented in Appendix C are much larger than expected and are bounded by the Construct New and Modify Existing Zone 12 South Facilities Collocation Option. As shown in Table 4.2.4.2–1, other than some added roadway, the operational infrastructure resource requirements are within site capacities.

Since impacts associated with storing all of the RFETS Pu and LANL Pu material at Pantex for long-term storage are minimal for construction and can be managed for operations, storing only a portion of the RFETS Pu and LANL Pu material at Pantex would result in minimal impacts to the site infrastructure as well. [Text deleted.]

Table 4.2.4.2–1. Site Infrastructure Changes Required for Operation at Pantex Plant (Annual)—No Action (2005) and Storage Alternatives

Alternative	Transportation		Electrical		Fuel		
	Roads (km)	Railroads (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
No Action							
Site availability	76	27	201,480	23	1,775,720	289,000,000	0
Projected usage	76	27	46,266	10	795,166	7,200,000	0
Upgrade (with RFETS Pu pits)							
Projected usage with upgraded facility	76	27	47,641	10.3	808,414	7,364,000	0
Amount required in excess to site availability	0	0	0	0	0	0	0
Upgrade (without RFETS Pu or LANL Pu material)							
Projected usage with upgraded facility	76	27	47,641	10.3	808,414	7,364,000	0
Amount required in excess to site availability	0	0	0	0	0	0	0
Upgrade (with RFETS Pu and LANL Pu material)							
Projected usage with upgraded facility	<81	27	94,266	19	833,166	12,300,000	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
Consolidation							
New and Modified Zone 12 South Facilities							
Projected usage with upgraded facility	<81	27	94,266	19	833,166	12,300,000	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
New Storage Facility							
Projected usage with consolidated facility	<81	27	89,266	18	833,166	11,700,000	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
Collocation							
Projected usage with collocated facilities	<81	27	104,266	20	833,166	12,400,000	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
Phaseout							
Projected usage with storage phaseout	76	27	46,266	10	795,166	7,200,000	0
Amount required in excess to site availability	0	0	0	0	0	0	0

Source: DOE 1996e; DOE 1996f; PX 1995a:2; PX DOE 1995g; PX DOE 1996a; PX MH 1994a.

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

Construction to modify the existing storage facility to consolidate long-term storage of Pu would have minimal impacts on the site infrastructure. Data for construction are presented in Appendix C. As shown in Table 4.2.4.2–1, some additional roadway would be required; the electrical and fuel infrastructure requirements for operations are within site capacities. [Text deleted.]

Construct New Plutonium Storage Facility

Construction of a new facility to consolidate long-term storage of Pu would have minimal impacts on the site infrastructure. Data for construction are presented in Appendix C. As shown in Table 4.2.4.2–1, some additional roadway would be required; the electrical and fuel infrastructure requirements for operations are within site capacities.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction for the collocated Pu and HEU storage facilities would have minimal impacts on the site infrastructure. Data for construction are presented in Appendix C. As shown in Table 4.2.4.2–1, some additional roadway would be required; the electrical and fuel infrastructure requirements for operations are within site capacities.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Since the existing Pantex site infrastructure would be capable of supporting construction/modification and operation of facilities for the No Action, Upgrade, Consolidation, or Collocation Alternatives, operating such facilities without including provisions for storage of strategic reserve and weapons R&D materials could be accommodated as well. Expected reductions in amounts of annual electrical energy requirements for the various storage facilities are the only site infrastructure changes expected if this subalternative is chosen because electric usage is dependent on the amount of material. [Text deleted.]

Phaseout

Pantex would be left with its weapons assembly/disassembly and HE fabrication missions. There would be no effects on the site infrastructure.

4.2.4.3 Air Quality and Noise

Construction and operation activities associated with the No Action Alternative and the proposed storage alternatives would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts at Pantex, criteria and toxic/hazardous concentrations from the No Action Alternative and the storage alternatives are compared with Federal and State standards and guidelines. Impacts from radiological airborne emissions are described in Section 4.2.4.9.

In general, all of the proposed storage facilities would emit the same types of air pollutants during construction. It is expected emissions would not exceed Federal, State, or local air quality regulations. PM_{10} and TSP concentrations will be increased, especially during peak construction periods.

The principal sources of emissions during construction include the following:

- Fugitive dust from land clearing, site preparation, excavation, and wind erosion of exposed ground surfaces
- Exhaust and road dust generated by construction equipment, vehicles delivering construction materials, and vehicles carrying construction workers

During operation, impacts from each of the individual storage facilities with respect to the concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Table 4.2.4.3–1 presents the estimated pollutant concentrations for each of the fissile materials storage alternatives, indicating little difference between alternatives with respect to impacts to air quality.

Emission rates attributed to operation of the proposed storage facilities are presented in Tables F.1.3–1 to F.1.3–3. [Text deleted.] Air pollutant emission sources associated with operations include the following:

- Operation of existing boilers for space heating
- Operation of diesel generators and periodic testing of emergency diesel generators
- Exhaust and road dust generated by vehicles delivering supplies and bringing employees to work
- Toxic/hazardous pollutant emissions from facility processes

Noise impacts during either construction or operation are expected to be low. Air quality and noise impacts for each storage alternative are described separately. Supporting data for the air quality and noise analyses are presented in Appendix F.

AIR QUALITY

An analysis was conducted of the potential air quality impacts of emissions from each of the storage alternatives as described in Section 4.1.3.

Section 176 (c) of the 1990 CAA Amendments requires that all Federal actions conform with the applicable SIP. EPA has implemented rules that establish the criteria and procedures governing the determination of conformity for all Federal actions in nonattainment and maintenance areas. These are discussed in Section 4.1.3. The attainment status of the area in which Pantex is located is discussed in Section 3.5.3. Since the area is considered to be an attainment area for criteria pollutants the proposed actions at this site do not require that a conformity analysis be performed.

Table 4.2.4.3–1. Estimated Operational Concentrations of Pollutants at Pantex Plant and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Consolidation: New and Modify Existing Zone 12 South Facilities ($\mu g/m^3$)	Consolidation: New Facility ($\mu g/m^3$)	Collocation ($\mu g/m^3$)
Criteria Pollutants							
Carbon monoxide	8-hour	10,000[b]	602	602	607.9	607.2	607.9
	1-hour	40,000[b]	2,900	2,900	2,921	2,922	2,921
Lead	Calendar Quarter	1.5[b]	0.09	0.09	0.09	0.09	0.09
Nitrogen dioxide	Annual	100[b]	2.15	2.15	2.29	2.28	2.29
Ozone	1-hour	235[b]	c	c	c	c	c
Particulate matter less than or equal to 10 microns in diameter	Annual	50[b]	8.73	8.73	8.77	8.76	8.77
	24-hour	150[b]	88.5	88.5	89.15	89.08	89.18
Sulfur dioxide	Annual	52[b]	<0.01	<0.01	<0.01	<0.01	<0.01
	24-hour	260[b]	<0.01	<0.01	0.05	0.04	0.05
	3-hour	1,300[b]	<0.01	<0.01	0.26	0.24	0.26
	30-minute	1,045[d]	<0.01	<0.01	0.69	0.65	0.69
Mandated by Texas							
Gaseous fluorides (as HF)	30-day	0.8[d]	<0.75	<0.75	<0.75	<0.75	<0.75
	7-day	1.6[d]	<0.75	<0.75	<0.75	<0.75	<0.75
	24-hour	2.9[d]	0.75	0.75	0.75	0.75	0.75
	12-hour	3.7[d]	1.05	1.05	1.05	1.05	1.05
	3-hour	4.9[d]	4.21	4.21	4.21	4.21	4.21
Hydrogen sulfide	30-minute	111[d]	e	e	e	e	e
Sulfuric acid	24-hour	15[d]	e	e	<0.01[g]	<0.01[g]	<0.01[g]
	1-hour	50[d]	e	e	0.01[g]	0.01[g]	0.01[g]
Total suspended particulates	3-hour	200[d]	f	e	3.62[g]	3.23[g]	3.77[g]
	1-hour	400[d]	f	e	9.75[g]	8.71[g]	10.15[g]

Table 4.2.4.3–1. Estimated Operational Concentrations of Pollutants at Pantex Plant and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Consolidation: New and Modify Existing Zone 12 South Facilities ($\mu g/m^3$)	Consolidation: New Facility ($\mu g/m^3$)	Consolidation: Collocation ($\mu g/m^3$)
Hazardous and Other Toxic Compounds							
1.1.1-Chloroethane	Annual	50[d]	0.53	0.53	0.53	0.53	0.53
	30-minute	500[d]	127	127	127	127	127
1.1.2-Trichloroethane	Annual	55[d]	0.08	0.08	0.08	0.08	0.08
	30-minute	550[d]	17.3	17.3	17.3	17.3	17.3
2-Nitropropane	Annual	5[d]	0.04	0.04	0.04	0.04	0.04
	30-minute	50[d]	8.55	8.55	8.55	8.55	8.55
Alcohols	Annual	[h]	0.70	0.70	0.70	0.70	0.70
	30-minute	[h]	195	195	195	195	195
Benzene	Annual	3[d]	0.06	0.06	0.06	0.06	0.06
	30-minute	30[d]	19.5	19.5	19.5	19.5	19.5
Carbon disulfide	Annual	3[d]	0.09	0.09	0.09	0.09	0.09
	30-minute	30[d]	22.6	22.6	22.6	22.6	22.6
Carbon tetrachloride	Annual	13[d]	0.08	0.08	0.08	0.08	0.08
	30-minute	126[d]	19.7	19.7	19.7	19.7	19.7
Chlorine	Annual	1.5[d]	[e]	[e]	<0.01[g]	<0.01[g]	<0.01[g]
	30-minute	15[d]	[e]	[e]	0.03[g]	0.03[g]	0.04[g]
Chlorobenzene	Annual	46[d]	0.08	0.08	0.08	0.08	0.08
	30-minute	460[d]	19.5	19.5	19.5	19.5	19.5

Table 4.2.4.3–1. Estimated Operational Concentrations of Pollutants at Pantex Plant and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Consolidation: New and Modify Existing Zone 12 South Facilities ($\mu g/m^3$)	Consolidation: New Facility ($\mu g/m^3$)	Consolidation: Collocation ($\mu g/m^3$)
Hazardous and Other Toxic Compounds (Continued)							
Chromium	Annual	0.1[d]	0.001	0.001	0.001	0.001	0.001
	30-minute	1[d]	0.13	0.13	0.13	0.13	0.13
Cresol	Annual	[h]	0.002	0.002	0.002	0.002	0.002
	30-minute	5[d]	0.41	0.41	0.41	0.41	0.41
Cresylic acid	Annual	[h]	0.002	0.002	0.002	0.002	0.002
	30-minute	5[d]	0.51	0.51	0.51	0.51	0.51
Dibenzofuran	Annual	[h]	0.00002	0.00002	0.00002	0.00002	0.00002
	30-minute	[h]	0.001	0.001	0.001	0.001	0.001
Ester glycol ethers	Annual	[h]	0.15	0.15	0.15	0.15	0.15
	30-minute	[h]	35.9	35.9	35.9	35.9	35.9
Ethyl benzene	Annual	434[d]	0.13	0.13	0.13	0.13	0.13
	30-minute	2,000[d]	31.1	31.1	31.1	31.1	31.1
Ethylene dichloride	Annual	4[d]	0.04	0.04	0.04	0.04	0.04
	30-minute	40[d]	9.58	9.58	9.58	9.58	9.58
Formaldehyde	Annual	1.5[d]	0.004	0.004	0.004	0.004	0.004
	30-minute	15d	0.37	0.37	0.37	0.37	0.37
Hydrogen chloride	Annual	0.1[d]	0.07	0.07	0.07	0.07	0.07
	30-minute	75[d]	6.17	6.17	6.18	6.18	6.17
Hydrazine	Annual	0.013[d]	[e]	[e]	<0.0001[g]	<0.0001[g]	<0.0001[g]
	30-minute	0.13[d]	[e]	[e]	0.01[g]	<0.01[g]	0.01[g]
Ketones	Annual	[h]	0.14	0.14	0.14	0.14	0.14
	30-minute	[h]	33.4	33.4	33.4	33.4	33.4
Mercury	Annual	0.05[d]	0	0	0	0	0
	30-minute	0.5[d]	0	0	0	0	0

Table 4.2.4.3–1. Estimated Operational Concentrations of Pollutants at Pantex Plant and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Consolidation: New and Modify Existing Zone 12 South Facilities ($\mu g/m^3$)	Consolidation: New Facility ($\mu g/m^3$)	Consolidation: Collocation ($\mu g/m^3$)
Hazardous and other Toxic Compounds (Continued)							
Methanol	Annual	262	0.58	0.58	0.58	0.58	0.58
	30-minute	2,620	245	245	245	245	245
Methyl ethyl ketone	Annual	590[d]	5.1	5.1	5.1	5.1	5.1
	30-minute	3,900[d]	1,400	1,400	1,400	1,400	1,400
Methyl isobutyl ketone	Annual	205[d]	0.02	0.02	0.02	0.02	0.02
	30-minute	2,050[d]	4.45	4.45	4.45	4.45	4.45
Methylene chloride	Annual	26[d]	0.74	0.74	0.74	0.74	0.74
	30-minute	260[d]	180	180	180	180	180
Naphthalene	Annual	50[d]	0.0001	0.0001	0.0001	0.0001	0.0001
	30-minute	440[d]	0.005	0.005	0.005	0.005	0.005
Nickel	Annual	0.015[d]	0.0002	0.0002	0.0002	0.0002	0.0002
	30-minute	0.15[d]	0.02	0.02	0.02	0.02	0.02
Nitric acid	Annual	5.2[d]	e	e	<0.01[g]	<0.01[g]	<0.01[g]
	30-minute	52[d]	e	e	0.04[g]	<0.04[g]	0.76[g]
Nitrobenzene	Annual	5[d]	0.002	0.002	0.002	0.002	0.002
	30-minute	24[d]	0.51	0.51	0.51	0.51	0.51
Phenol	Annual	19[d]	0.0006	0.0006	0.0006	0.0006	0.0006
	30-minute	154[d]	0.03	0.03	0.03	0.03	0.03
Phosphoric acid	Annual	1[d]	e	e	<0.01[g]	<0.01[g]	<0.01[g]
	30-minute	10[d]	e	e	0.01[g]	0.01[g]	0.01[g]
Sulfuric acid	24-hour	15[d]	e	e	<0.01[g]	<0.01[g]	<0.01[g]
	1-hour	50[d]	e	e	0.01[g]	0.01[g]	0.01[g]
Tetrachloroethylene	Annual	34[d]	0.07	0.07	0.07	0.07	0.07
	30-minute	340[d]	17.6	17.6	17.6	17.6	17.6

Table 4.2.4.3–1. Estimated Operational Concentrations of Pollutants at Pantex Plant and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Consolidation: New and Modify Existing Zone 12 South Facilities ($\mu g/m^3$)	Consolidation: New Facility ($\mu g/m^3$)	Consolidation: Collocation ($\mu g/m^3$)
Hazardous and Other Toxic Compounds (Continued)							
Toluene	Annual	188[d]	1.73	1.73	1.73	1.73	1.73
	30-minute	1,880[d]	556	556	556	556	556
Trichloroethylene	Annual	135[d]	0.21	0.21	0.21	0.21	0.21
	30-minute	1,350[d]	51.1	51.1	51.1	51.1	51.1
Triethylamine	Annual	4[d]	0.002	0.002	0.002	0.002	0.002
	30-minute	40[d]	1.08	1.08	1.08	1.08	1.08
Xylene	Annual	434[d]	0.47	0.47	0.47	0.47	0.47
	30-minute	3,700[d]	145	145	145	145	145

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.

[b] Federal and State standards.

[c] Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate site. See Section 4.1.3 for a discussion of ozone-related issues.

[d] State standard or guideline.

[e] No sources of this pollutant have been identified.

[f] Data not available from source document.

[g] The concentration represents the alternative contribution only.

[h] No standard.

Note: 1-hour predicted concentrations were used for 30-minute standard. Concentrations are based on site contribution, including concentrations from ongoing activities (No Action), and do not include the contribution from non-facility sources (for example, traffic). The Upgrade With RFETS Pu and LANL Pu Material Subalternative is the same as the New and Modify Existing Zone 12 South Facilities Consolidation Option.

Source: 40 CFR 50; DOE 1996e; DOE 1996f; PX DOE 1996a; PX DOE 1996b; PX MH 1994a; TX ACB 1987a; TX NRCC 1992a; TX NRCC 1995a.

No Action Alternative

This alternative utilizes estimated air emissions data from total site operations at Pantex assuming continuation of site missions as described in Section 3.5. These data reflect conservative estimates of criteria and toxic/hazardous emissions at Pantex. The emission rates for the criteria and toxic/hazardous pollutants for No Action for the total site are presented in Table F.1.2.5–1. Table 4.2.4.3–1 presents the No Action concentrations. During dry and windy conditions, increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside of the scope of this PEIS) under the No Action Alternative. Concentrations of all criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable Federal, State, and local ambient air quality standards.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Increased PM_{10} and TSP concentrations may occur during the peak construction period, particularly during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. Concentrations of all pollutants at the site boundary or public-access highways would remain within applicable Federal and State ambient air quality standards during construction.

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.4.3–1.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Air quality impacts for construction and operation for this subalternative are expected to be similar to those for the Consolidation Alternative Construct New and Modify Existing Zone 12 South Facilities Option for Pantex.

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

Increased PM_{10} and TSP concentrations may occur during the peak construction period, particularly during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations

during construction. Concentrations of all pollutants at the site boundary would remain within applicable Federal and State ambient air quality standards.

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.4.3–1.

Construct New Plutonium Storage Facility

In addition to the types of sources of emissions during construction associated with the No Action Alternative and the Upgrade Alternative, fugitive dust resulting from the operation of a concrete batch plant would be an additional emission source associated with this storage alternative.

Increased PM_{10} and TSP concentrations may occur during the peak construction period for the new storage facility option, particularly during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. Concentrations of all pollutants at the site boundary would remain within applicable Federal and State ambient air quality standards during construction.

During operation, impacts with respect to the concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.4.3–1.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The collocation of Pu and HEU facilities would be located in the same area as the consolidation of Pu facility and would have similar air quality impacts, with the following exceptions. During operation, emissions would be higher, as shown in Appendix F. Concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.4.3–1.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Air quality impacts for construction and operation for this option are expected to be similar to those described previously for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

Phaseout of existing Pu inventories as a result of consolidating Pu at another site is expected to result in a small reduction in air pollutant concentrations from the No Action concentrations and would be in compliance with Federal and State standards.

NOISE

The location of the proposed storage facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise sources during construction may include

heavy construction equipment and increased traffic. Increased traffic would occur onsite and along offsite local and regional transportation routes used to bring construction material and workers to the site.

No Action Alternative

Nontraffic noise sources associated with continued storage and other ongoing missions are the same as described in Chapter 3. The continuation of operations at Pantex would result in no appreciable change in traffic noise and onsite operational noise sources from current levels. Nontraffic noise sources are located at sufficient distance from offsite areas that the contribution to offsite noise levels would continue to be small. Due to the size of the site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may be located close enough to onsite noise sensitive areas to result in impacts, such as disturbance of wildlife.

Upgrade (Preferred Alternative), Consolidation, and Collocation Alternatives

Nontraffic noise sources associated with the storage Upgrade Alternative would be similar to those for existing facilities as discussed in Chapter 3. Nontraffic, operational noise sources associated with the consolidation of Pu and collocation of Pu and HEU alternatives include additional equipment and machines (cooling systems, vents, motors, and material handling equipment). These noise sources would be located at sufficient distance from offsite areas that the contribution to offsite noise levels would be small. Due to the size of the site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts, such as disturbance of wildlife.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Noise impacts for construction and operations for this option are expected to be almost the same as those previously described for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative because noise impacts are based on the use of the facility and not the size. [Text deleted.]

Phaseout

A reduction in noise levels may result from the phaseout of storage facilities.

4.2.4.4 Water Resources

Construction and operation of the proposed long-term storage facilities at Pantex would affect water resources. All water required for construction or operation would be supplied from groundwater. The Ogallala Aquifer, which would be used to accommodate water requirements, has been projected to be adequate up to the year 2040 by TNRCC. The proposed facilities would be located outside the 100- and 500-year floodplain. During construction, treated sanitary wastewater would be discharged to the playas. During operations, all wastewater would be treated and either recycled or discharged to the playas. No wastewater would be discharged to non-playa surface waters during operation of the facilities. Thus, impacts to surface water quality are not expected. Stormwater runoff would be collected and treated, if necessary, before discharge to natural drainage channels. [Text deleted.] Table 4.2.4.4–1 presents No Action water resources uses and discharges and the potential changes to water resources at Pantex resulting from the long-term storage alternatives.

No Action Alternative

Surface Water. [Text deleted.] A description of the activities that would continue at Pantex is provided in Section 3.5. No demands on surface water supplies would occur. However, current wastewater discharges to Playas 1, 2, and possibly 4 of 478 million l/yr (126 million gal/yr) would decrease to approximately 141 million l/yr (37.3 million gal/yr) by the year 2005. Since surface water is not used at Pantex, there would be no impacts to surface water availability or quality from the this alternative.

Groundwater. Under this alternative, baseline conditions and operations, described in Section 3.5.4, would continue at the plant, and current groundwater usage of 836 million l/yr (221 million gal/yr) would decrease to 249 million l/yr (65.7 million gal/yr) by the year 2005. Groundwater used would continue to be withdrawn from the Ogallala Aquifer through wells located on the Pantex property. Under this alternative current groundwater restoration and characterization studies would continue. As part of the restoration activities for the perched aquifer, contaminated groundwater is pumped, treated, and reinjected back into this aquifer. This remediation effort should improve the quality of the perched aquifer groundwater. [Text deleted.]

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Surface Water. There are no unique construction characteristics associated with water requirements and discharges from this alternative. No surface water would be withdrawn for any construction or operation activities associated with any of the proposed Pu storage upgraded facilities. Therefore, there would be no impacts to surface water availability. Nonhazardous wastewater generated during construction and operation of the upgraded Pu storage facilities would either be recycled or treated and released to the playas under the permit requirements. Approximately 3.1 million l/yr (0.83 million gal/yr) of nonhazardous wastewater would be generated during the construction phase. In 1994, Pantex averaged approximately 1.4 million l/day (370,000 gal/day) of wastewater discharge to the playas. This quantity is expected to decrease in the future. Discharge of this additional wastewater to playas would not result in exceedance of the TNRCC-permitted monthly average maximum limit of 2.46 million l/day (650,000 gal/day).

During operation, utility, process, and sanitary wastewater and cooling system blowdown for the upgraded Pu storage facilities would either be recycled or treated and discharged into playas. Approximately 12.9 million l/yr (3.4 million gal/yr) of sanitary wastewater would be processed using existing and planned liquid nonhazardous waste facilities during operation; exceedance of the discharge limitation is not expected. This amount would

Table 4.2.4.4–1. No Action and Potential Changes to Water Resources at Pantex Plant—No Action (2005) and Storage Alternatives

Affected Resource Indicator	No Action	Upgrade			Consolidation			
		With RFETS Pits	Without RFETS or LANL Material	With RFETS and LANL Material	New and Modify Zone 12	New Facility	Collocation	Phaseout
Water Source	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground
Construction								
Water Availability and Use								
Total water requirement (million l/yr)	NA[a]	6.4	6.4	80	80	85	104.7	0
Percent increase in projected water use[b]	NA[a]	2.6	2.6	32.1	32.1	34.1	42	0
Water Quality								
Total wastewater discharge (million l/yr)	NA[a]	3.1	3.1	8.0	8.0	8.0	12.2	0
Percent change in wastewater discharge[c]	NA[a]	2.2	2.2	5.7	5.7	5.7	8.7	0
Operation								
Water Availability and Use								
Total water requirement (million l/yr)	249	27.5	27.5	110	110	98	130	0
Percent increase in projected water use[d]	0	11.0	11.0	44.2	44.2	39.4	52.2	0
Water Quality								
Total wastewater discharge (million l/yr)	141	12.9	12.9	0	0	0	0	0
Percent change in wastewater discharge[e]	0	9.1	9.1	0	0	0	0	0

Table 4.2.4.4–1. No Action and Potential Changes to Water Resources at Pantex Plant—No Action (2005) and Storage Alternatives—Continued

Affected Resource Indicator	No Action	Upgrade			Consolidation			
		With RFETS Pits	Without RFETS or LANL Material	With RFETS and LANL Material	New and Modify Zone 12	New Facility	Collocation	Phaseout
Floodplain								
Is action in 100-year floodplain?	NA	No	No	No	No	No	No	No
Is critical action in 500-year floodplain?	NA	No	No	No	No	No	No	No

[a] See operations section of table for No Action water data.

[b] Percent increases in projected water use during construction at Pantex are calculated by dividing No Action water requirements (249 million l/yr) with that for each storage option: upgrade existing storage facility with RFETS Pu pits (6.4 million l/yr), upgrade existing storage facility without RFETS or LANL material (6.4 million 1/yr), Pu storage upgrade with all RFETS and LANL material (80 million l/y), consolidate through modification of existing facility (80 million l/yr), new storage facility (85 million l/yr), collocation of Pu and HEU storage (104.7 million l/yr), and storage phaseout (0 l/yr).

[c] Percent changes in wastewater discharge during construction at Pantex are calculated by dividing No Action wastewater discharges (141 million l/yr) with that for each storage option: upgrade existing storage facility with RFETS Pu pits (3.1 million l/yr), upgrade existing storage facility without RFETS or LANL material (3.1 million l/yr), Pu storage upgrade with all RFETS and LANL material (8.0 million l/yr), consolidate through modification of existing facility (8.0 million l/yr), new storage facility (8.0 million l/yr), collocation of Pu and HEU storage facility (12.2 million l/yr), and storage phaseout (0 l/yr).

[d] Percent increases in projected water use during operations at Pantex are calculated by dividing No Action waste requirements (249 million l/yr) with that for each storage option: upgrade existing storage facility with RFETS Pu pits (27.5 million l/yr), upgrade existing storage facility without RFETS or LANL material (27.5 million l/yr), Pu storage upgrade with all RFETS and LANL material (110 million l/yr), consolidate through modification of existing facility (110 million l/yr), new storage facility (98 million l/yr), collocation of Pu and HEU storage facility (130 million l/yr), and storage phaseout (0 l/yr).

[e] Percent changes in wastewater discharge during operations at Pantex are calculated by dividing No Action wastewater discharges (141 million l/yr) with that for each storage option: upgrade existing storage facility with RFETS Pu pits (12.9 million l/yr), upgrade existing storage facilities without RFETS or LANL material (12.9 million l/yr), Pu storage upgrade with all RFETS and LANL material (0 million l/yr), consolidate through modification of existing facility (0 l/yr), new storage facility (0 l/yr), collocation of Pu and HEU storage facility (0 l/yr), and storage phaseout (0 l/yr).

Note: NA=not applicable. Construction impacts are considered to be temporary, lasting throughout the construction period. Impacts from operations would occur continuously. Wastewater will be recycled during operations for all options, except for Pu storage upgrade.

Source: DOE 1996e; DOE 1996f; PX 1995a:2; PX DOE 1996a; PX MH 1994a.

represent a 9.1 percent increase in the amount being discharged. The treated effluent would be monitored to comply with the requirements. The extent to which treated effluent or stormwater would be recycled for reuse within the facility would be determined during site-specific studies.

The facility to be upgraded is located in Zone 12. Since 100-year, 500-year, or standard project flood boundaries are not located in Zone 12, there will be no impacts to floodplains. No construction would occur in areas delineated as 100-year floodplains.

Groundwater. All water required for construction and operation would be supplied from groundwater. The Ogallala Aquifer, which is the source of water for operations at Pantex, has been projected to be adequate up to the year 2040 by the TNRCC. Construction and operation water requirements for the upgraded Pu storage facilities are small relative to the total water in aquifer storage, which for the year 2010 has been estimated at 287 trillion l (76 trillion gal) (PX WDB 1993a:1). As shown in Table 4.2.4.4–1, construction of the proposed upgraded facilities would require 6.4 million l/yr (1.7 million gal/yr) of water, which represents approximately a 2.6-percent increase over the projected No Action groundwater usage. Regional groundwater levels would have minimal impacts.

Previous studies have shown that when the Amarillo City Well Field pumped 18.5 billion l/yr (4.9 billion gal/yr) from the Ogallala aquifer, an average of 1.8-m/yr (5.9-ft/yr) decline in the water table occurred over a 10-year period in the local well field area. This water level decline caused a shift in the groundwater flow direction beneath Pantex. Operating the proposed upgraded Pu storage facilities at Pantex would require 27.5 million l/yr (7.3 million gal/yr), resulting in a minimal drawdown representing 1.4 percent of the available groundwater (1,900 million l/yr [502 million gal/yr]). This additional groundwater withdrawal would cumulatively add to the existing decline in water levels of the Ogallala Aquifer. However, there should be minimal impacts to regional groundwater levels from this additional withdrawal. The total water withdrawal including this alternative would be 276.4 million l/yr (73 million gal/yr) which, because of expected cutbacks in other programs, would be 67 percent less than what is currently being withdrawn (836 million l/yr [221 million gal/yr]) from the Ogallala Aquifer by Pantex.

Construction and operation of the proposed upgraded Pu storage facilities would not result in direct discharges to groundwater, so contamination of the Ogallala Aquifer is not expected. Treated wastewater discharged to playas, however, could percolate downward into the groundwater of the near surface aquifer. This water would be monitored according to requirements and would not be discharged to the playas until contaminant levels were within the limits specified by the TNRCC. Since the supply wells located in the area withdraw potable water from the deep Ogallala Aquifer, the existing plume in the near-surface aquifer should not be affected by the upgraded Pu storage facilities. Pantex will continue to evaluate groundwater contamination in both the perched and Ogallala aquifers.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The annual water requirements during construction and operation are 80 million l/yr (21.1 million gal/yr) and 110 million l/yr (29.1 million gal/yr), respectively. These additional requirements represent 32.1- and 44.2-percent increases, respectively, in the projected No Action withdrawals from the Ogallala Aquifer. The quantity required for operation represents 5.8 percent of the available groundwater (1,900 million l/yr [502 million gal/yr]). This additional groundwater withdrawal would cumulatively add to the existing decline in water levels of the Ogallala Aquifer. However, there should be minimal impacts to regional groundwater levels from this additional withdrawal. The total water withdrawal including this alternative would be 359 million l/yr (94.8 million gal/yr), which, because of expected cutbacks in other programs, would be 57 percent less than what is currently being withdrawn (836 million l/yr [221 million gal/yr]) from the Ogallala Aquifer by Pantex.

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

The water resource requirements and impacts for this alternative are identical to those discussed above for the Upgrade With All or Some RFETS Pu and LANL Pu Subalternative.

Construct New Plutonium Storage Facility

The Pu storage facility would be located in Zone 12 South. The impacts associated with this option are the same as those discussed above for the Pu consolidate through upgrading, with the following exceptions. The water requirements of this option are slightly less than those for consolidate through upgrading with RFETS and LANL material. This option would require approximately 85 million l/yr (22.5 million gal/yr) and 98 million l/yr (26 million gal/yr) of water for construction and operation, respectively. These additional requirements represent 34.1- and 39.4-percent increases, respectively, in the projected annual No Action withdrawals from the Ogallala Aquifer. [Text deleted.] The total water withdrawal including this alternative would be 347 million l/yr (91.7 million gal/yr), which, because of expected cutbacks in other programs, would be 58 percent less than what is currently being withdrawn (836 million l/yr [221 million gal/yr]) from the Ogallala Aquifer by Pantex.

Sanitary wastewater quantities generated during construction of this option would be the same as for the previous option and are approximately 8.0 million l/yr (2.1 million gal/yr). These effluents would be discharged to the playas under the permit. The maximum quantity of additional wastewater (approximately 0.03 million l/day [7,900 gal/day]) would not cause any exceedances of the maximum limit of 3.1 million l/day (820,000 gal/day). During operations, wastewater would be recycled. Since surface water would not be used for this option, no impacts to surface water availability would occur.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Because the collocated storage facilities would be located in the same area as the new Pu storage facility (Zone 12 of Pantex), the impacts associated with it are the same as those discussed above, with the following exceptions. The water requirements for construction and operation of this option are greater than those for the previous options. This option would require approximately 104.7 million l/yr (27.7 million gal/yr) and 130 million l/yr (34 million gal/yr) for construction and operation, respectively. These additional requirements

represent 42- and 52.2-percent increases, respectively, in the projected No Action annual groundwater withdrawals from the Ogallala Aquifer and would be 5.5- and 6.8-percent of the available groundwater (1,900 million l/yr [502 million gal/yr]). [Text deleted.] The total water withdrawal including this alternative would be 379 million l/yr (100 million gal/yr) which would be 55 percent less than what is currently being withdrawn (836 million l/yr [221 million gal/yr]) from the Ogallala Aquifer by Pantex.

Sanitary wastewater quantities generated during construction would be approximately 12.2 million l/yr (3.2 million gal/yr); this water would be treated and discharged to the playas. For the same reasons as discussed for the previous option, no exceedances of the discharge limit would be expected. During operations, all wastewater would be recycled, causing no impacts.

Although the expected drawdowns caused by withdrawing the water required for the potential long-term Pu storage options are relatively small, the overall decline of groundwater levels in the Amarillo area is of concern. Groundwater conservation measures that could be considered include limiting groundwater production hours, installing dripless faucets, and reusing process water. In addition, to alleviate some of the effects from pumping groundwater from the Ogallala Aquifer, the city of Amarillo is considering supplying treated wastewater to Pantex for industrial use from the Hollywood Road Wastewater Treatment Plant. However, details of this mitigation measure have not been determined. Mitigation measures to reduce wastewater seepage and protect groundwater quality could include building lined evaporation ponds.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Water resource impacts for construction and operation for this subalternative are expected to be slightly less than those discussed for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative because of the reduction in the amount of material. [Text deleted.]

Phaseout

If the current Pu storage mission at Pantex is phased out, groundwater withdrawals from the Ogallala aquifer and nonhazardous wastewater discharge to playas would decrease by negligible quantities. By decreasing groundwater withdrawals, however, Pantex would lessen its contribution to the declining groundwater levels of the Ogallala Aquifer by a very small amount. Reducing wastewater discharges to the playas by this quantity should not cause any noticeable impacts.

[Text deleted.]

4.2.4.5 Geology and Soils

Construction and operation of the alternatives at Pantex would have no impact on the geologic resources. A low seismic risk exists, but it would be considered in the design of the proposed alternatives. The existing seismic risk does not preclude the safe construction and operation of the proposed alternative facilities. The facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1, *Facility Safety*. Because there are no known capable faults at Pantex, the potential for ground rupture as a result of an earthquake during the life of the facility is minimal; ground shaking is more likely. Intensities of more than IV on the MMI scale are not likely at Pantex. Ground shaking could affect the integrity of inadequately designed or nonreinforced structures but would not affect newly designed facilities. Human health effects from accidents initiated by natural phenomena (for example, earthquakes) are discussed in Section 4.2.4.9. Volcanic activity is not anticipated to affect the construction and operation of the alternatives. It is also unlikely that landslides or other nontectonic events would affect the proposed alternatives. Salt dissolution is an active process in the southern High Plains area. However, no surficial expression of sinkholes or fractures associated with salt dissolution have been identified in Carson County. Potential effects due to subsidence, are negligible because salt dissolution is a slow process relative to human activities. Properties and conditions of soils underlying Pantex typically have no limitations on construction with the exception of moderate to severe shrink-swell potential in nearly all areas of Pantex. This factor would be considered in facility design and site preparation. No economically viable geologic resources are known to be present at Pantex.

Impacts to the geologic and soil resource occur during, or as a result of, ground-disturbing construction activities. Construction of the alternatives may involve ground-disturbing activities which could impact the soil resources. The amount of land disturbed is specified below for each alternative. Impacts would depend on the specific soil units in the disturbed area, the extent of land disturbing activities, and the amount of soil disturbed. Within Pantex, the soil erosion potential is directly related to the amount of land disturbed because soil and climatic conditions are similar throughout the site. Control measures would be employed to minimize soil erosion.

[Text deleted.]

No Action Alternative

[Text deleted.] Under the No Action Alternative, DOE would continue current and ongoing activities at Pantex. There would be no ground-disturbing activities beyond those associated with existing and future site improvements. Because no new construction and the associated ground disturbance for potential soil erosion would occur, the No Action Alternative would have no effect on the geologic or soil resources at the site.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

No apparent direct or indirect effects on the geologic resource are anticipated, because neither facility construction and operational activities nor site infrastructure improvements will limit access to potential geologic resources.

Construction activities will occur completely on previously disturbed land, as described in Section 4.2.4.1. The soil disturbance during construction activities would be approximately 0.18 ha (0.45 acres). Soil disturbance would occur primarily from ground-disturbing construction activities (foundation preparation) and activities associated with building construction laydown areas that can expose the soil profile and lead to a possible

increase in soil erosion as a result of wind and water action. Soil loss would depend on the frequency and severity of rain, wind velocities (increases in wind velocity and duration increase potential soil erosion), and the size, location, and duration of ground-breaking activities.

Net soil disturbance during operations would be considerably less than during construction because areas temporarily used for construction laydown would be restored. Although stormwater runoff and wind action could occur during operations, they are anticipated to be minimal.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Construction and operation effects on geological and soil resources would be the same as those described for the Upgrade With RFETS Pu Pits Subalternative. The soil disturbance during construction activities would be approximately 0.18 ha (0.45 acres) and would occur completely on previously disturbed land. This disturbance would affect the soil profile and lead to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil impacts during operation are expected to be minimal. An analysis of the operational effects on the soil resource is provided in the Upgrade With RFETS Pu Pits Subalternative.

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

No apparent direct or indirect effects on the geologic resource are anticipated because neither facility construction and operational activities nor site infrastructure improvements will restrict access to potential geologic resources.

[Text deleted.] Construction of the storage facilities would occur on previously disturbed land as described in Section 4.2.4.1. However, under this alternative additional soil impacts are anticipated because it has greater construction and operating land use requirements. Approximately 60.5 ha (149 acres) would be disturbed for construction of the Consolidation Alternative. This disturbance would affect the soil profile and lead to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Analysis of operational effects in this section is the same as that provided for the Upgrade Alternative.

Construct New Plutonium Storage Facility

[Text deleted.] Construction of the storage facility would occur on previously disturbed land as described in Section 4.2.4.1. Approximately 58.5 ha (144 acres) of land would be disturbed for the new facility, affecting the soil profile and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. [Text deleted.]

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

No apparent direct or indirect effects on the geologic resource are anticipated, because neither facility construction and operational activities nor site infrastructure improvements will restrict access to potential geologic resources.

Construction and operation effects on geology and soil resources for the Collocation Alternative would be similar to those described for the Consolidation Alternative. However, additional soil impacts would be expected from the construction of the storage facilities that will occur completely on previously disturbed land. During construction, approximately 89.5 ha (221 acres) would be required for the new facilities, affecting the soil profile and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil impacts during operation are expected to be minimal.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Exclusion of strategic reserve and weapons R&D materials would give almost the same effects to the geological and soil resources for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. By excluding these materials the size of a facility would be similar, thus not changing the amount of land disturbed by construction activities. No effect to the geologic resource is anticipated as a result of this subalternative.

Phaseout

The phaseout of storage capacity would have no apparent effects on the geology and soil resource. However, phaseout could result in beneficial effects on the soils of the area. Hazardous, radioactive, and mixed waste sources would be eliminated from the area, thus decreasing the potential for future soil contamination.

[Text deleted.]

4.2.4.6 Biological Resources

No Action Alternative

Under No Action, the Pu storage mission described in Section 2.2.4 would continue at Pantex. This activity would result in no appreciable change to current conditions of biological resources at Pantex as described in Section 3.5.6.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Upgrading the existing Pu storage facility at Pantex would cause minimal disturbance to biological resources. This is the case since all activities would take place within an area that is currently disturbed by site structures. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the developed area have already adapted to its presence. Impacts to wetlands and aquatic resources would not occur since these resources are not found in the upgrade area. Since the upgrade would take place within a developed area, impacts to threatened and endangered species would not be expected.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Upgrading with all or some RFETS and LANL material would not be expected to change impacts to biological resources from those described for the Upgrade With RFETS Pu Pits Subalternative.

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

Under this alternative, Pu would be consolidated in a modified existing facility at Pantex requiring some new construction. Modification of existing facilities would occur on previously disturbed land and, therefore, would cause minimal disturbance to biological resources. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the developed area have already adapted to its presence. Construction-related ground disturbance may increase the potential for sediment runoff effects to playa wetlands and aquatic habitat. This impact would be controlled through the implementation of standard soil erosion and sediment control measures. Since this alternative

occurs within a developed area, impacts to threatened and endangered species would not be expected. Consultation with USFWS and State agencies would be conducted at the site-specific level, as appropriate. [Text deleted.]

[Text deleted.]

Construct New Plutonium Storage Facility

Impacts to biological resources from a new storage facility would be nearly the same as those described for the construction of a new facility and the modification of an existing facility alternatives addressed above. This is the case since both options would be located in the same general area of the Pantex site and both would occur on previously disturbed land. [Text deleted.]

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Under this alternative, Pu material would be stored with HEU inventories in a new collocated storage facility at Pantex. Construction and operation of collocated storage facilities would occur on previously disturbed land and therefore would cause minimal disturbance to biological resources similar to, but somewhat greater than those described for the consolidated storage facility alone. [Text deleted.]

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve and weapons R&D materials would have almost the same effects to the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. The size of the facility would be similar and would not result in the reduction of disturbed habitat and/or fewer facility modifications and the potential impacts to biological resources would be similar. [Text deleted.]

Phaseout

During phaseout of Pu storage facilities at Pantex, short-term increased human activity could disturb some wildlife species on the site. Following phaseout activities, the wildlife populations would be expected to return to pre-phaseout size and location. The only effect to wetlands and aquatic resources would be a slight reduction of wastewater discharge to playas.

4.2.4.7 Cultural and Paleontological Resources

No Action Alternative

Under this alternative, DOE would continue the existing and planned missions at Pantex. Pantex material (pits) would continue to be stored in Zone 4 Magazines pursuant to DNFSB Recommendation 94-1. Any impacts to cultural or paleontological resources from these missions would be independent of the proposed action and would be addressed through separate NHPA, *American Indian Religious Freedom Act*, and *Native American Graves Protection and Repatriation Act* regulatory compliance procedures. DOE is developing an interim Programmatic Agreement that will be ready by FY97. This Agreement will be superseded by the Cultural Resources Management Plan for Pantex, which is scheduled for implementation in 1998. Currently, cultural resources are managed through existing interim procedures according to Sections 106 and 110 of the NHPA. A Native American outreach program has also been initiated.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

This option involves the expansion of existing Building 12-66 in Zone 12 and the use of Buildings 12-82, 12-116, and 12-117 and associated ramps. Building 12-66 is not considered NRHP-eligible based on an evaluation of World War II Era structures at Pantex (PX LRA 1994a:125). However, determinations of NRHP-eligible Cold War Era structures have not been completed, and some structures in Zone 12 may be determined eligible on that basis. The zone is developed and disturbed and probably does not contain any intact archaeological deposits, so no impacts to prehistoric or historic sites are anticipated, even on lands used for equipment laydown or construction parking. Minimal impacts to Native American or paleontological resources are expected to result from this option. Land disturbance during building modification is expected to be 0.18 ha (0.45 acres) and the land required during operation would total 0.1 ha (0.25 acres). Impacts to cultural or paleontological resources are expected to be minimal.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

This subalternative involves modification to the previously mentioned facilities. Land disturbance during building modification, construction, and operation is expected to be the same as required for the other upgrade subalternative. Impacts to cultural or paleontological resources are expected to be minimal.

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

New construction and building modification would occur on previously disturbed land in Zone 12 South. A reduced-access buffer zone would exist around the facility. Buildings 12-66 and 12-82 would be modified. [Text deleted.] Although it is possible that subsurface remains exist within Pantex, the project area is disturbed and probably does not contain any intact archaeological sites. Consequently, impacts to prehistoric or historic resources are not anticipated. Additional surveys may be necessary for compliance with the NHPA. Should any resources be discovered during construction, mitigation measures would be taken in consultation with the Texas SHPO. [Text deleted.]

The DOE has begun a public outreach program to involve Native American groups in decisionmaking related to land use and cultural resources. [Text deleted.] Facility operation can have an auditory or visual impact on sacred or ceremonial sites. To date, none of the Native American tribes known to have traditional interest in Pantex lands have identified any traditional cultural resources at Pantex. Additional consultation may identify some of these resources.

Construct New Plutonium Storage Facility

This option involves consolidation through new construction on land in Zone 12 South. It would be constructed on previously disturbed land. A reduced-access buffer zone would be created around the facility. The same potential for impacts to cultural and paleontological resources from the construction and operation of the proposed facility exists as described under the previous consolidation option.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The proposed action is to construct a new facility on previously disturbed land in Zone 12 South to accommodate all Pu and HEU material within the scope of the PEIS. A buffer zone would be created around the facility. Impacts to cultural and paleontological resources resulting from this alternative would be similar to those described under the Consolidation Alternative.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, facility and other resource requirements will be almost the same as the No Action Alternative, the Upgrade Alternatives, the Consolidation Alternative, and the Collocation Alternative. Therefore, the impacts to cultural and paleontological resources would be equal to those previously described. [Text deleted.]

Phaseout

Under this alternative, Pantex Pu material would be moved to the consolidation or collocation sites or to disposition. No impacts to cultural or paleontological resources are expected to result from this action.

[Text deleted.]

4.2.4.8 Socioeconomics

No Action Alternative

Under this alternative, the existing storage facility would remain operational. No new employment or in-migration of workers would be required.

Regional Economy Characteristics. Total employment growth in the REA is projected to average less than 1 percent annually between 1995 and 2040. Total employment is projected to reach 221,800 in 2000 and increase to 254,400 in 2040. Unemployment in the REA was 4.8 percent in 1994 and is projected to remain at this level into the near future. Per capita income is projected to increase from approximately $19,435 in 1995 to $22,671 in 2040. Projections for the No Action alternative are presented in Table L.1–37.

Population and Housing. Population in the ROI is projected to increase from 206,400 in 1995 to 240,800 by 2040. The total number of housing units in the ROI is projected to increase from 85,400 in 1995 to 99,600 by 2040. Population and housing projections for the No Action Alternative are presented in Appendix Tables L.1–38 and L.1–39, respectively.

Community Services. Education, public safety, and health care characteristics are used to assess the level of community services in the Pantex ROI. School enrollments are projected to increase from 39,720 students in 1995 to 46,360 students by 2040. The current student-to-teacher ratio is 16.3:1 and to maintain this level of service, the number of teachers in the ROI would need to increase from 2,438 in 1995 to 2,846 in 2040. No Action projections are presented in Appendix Tables L.1–40 and L.1–41.

The projected numbers of sworn police officers and firefighters serving ROI communities between 1995 and 2040 are shown in Tables L.1–42 and L.1–43, respectively. Under No Action, the number of sworn police officers is projected to increase from 463 in 1995 to 542 in 2040 if the current service level of 2.3 officers per 1,000 persons is maintained. The number of firefighters in the ROI would need to increase from 412 in 1995 to 481 in 2040 to maintain the current level of service of 2.3 firefighters per 1,000 persons.

Hospital occupancy rates are based on current capacity. Hospital occupancy rates and the estimated number of practicing physicians serving the ROI population during the period 1995 to 2040, are presented in Tables L.1–44 and L.1–45, respectively. Hospital occupancy rates in the ROI are projected to increase from 56 percent in 1995 to 65 percent in 2040. If the current physician-to-population ratio of 2.0 physicians per 1,000 persons is maintained, the total number of physicians is projected to increase from 408 in 1995 to 476 in 2040.

Local Transportation. The worker population at Pantex would not increase. Therefore, any increases in traffic would be due to the projected growth in the area unrelated to DOE activities. [Text deleted.]

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The upgrade to continue storing the Pu already located at Pantex and RFETS pits would require 19 workers during peak construction and 90 workers during full operation. There would be sufficient available labor in the REA to fill both direct and indirect jobs created by construction. Therefore, no workers would in-migrate to the region and no change to the region's population would result beyond No Action projections. Some specialized workers would in-migrate during operation.

Regional Economy Characteristics. During peak construction of the upgraded facility, a total of 34 jobs (19 direct and 15 indirect) would be generated. Unemployment in the REA would remain at 4.8 percent, as projected under No Action, and the per capita income would increase by less than 1 percent (Socio 1996a).

Operation of the facility would generate a total of 406 jobs (90 direct and 316 indirect). Total employment in the REA would increase less than 1 percent over No Action, and the unemployment rate would fall to 4.7 percent. Per capita income would increase less than 1 percent (Socio 1996a).

Population and Housing. Projections indicate that there would be sufficient available labor to fill all of the direct and indirect jobs generated by the construction of the facility. However, some qualified workers would in-migrate to the region during the operation of the facility. Any population increase in the region would be much less than 1 percent, and projected housing vacancies would be sufficient to accommodate the slight population growth.

Community Services. No in-migration would occur during construction and the size of the population change during operations would be too small to affect the demand for most community services. Therefore, demand for community services would be the same as for No Action, although one additional physician would be required to maintain the physician to population ratio of 2.0 physicians per 1,000 persons for the ROI.

Local Transportation. During peak construction of the facility, workers would generate 36 vehicle trips per day, and during full operations, workers would generate 173 vehicle trips per day. These increases would not affect the level of service on the local road segments analyzed (Socio 1996a).

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

Construction and operation employment requirements for this facility would be greater than for the Upgrade With RFETS Pu Pits Subalternative, but smaller than for the Consolidation Alternative to Construct New and Modify Existing Zone 12 South Facilities. Therefore, the socioeconomic impacts would likely be greater than previously discussed for the Upgrade With RFETS Pu Pits Subalternative, but smaller than discussed for the Consolidation through upgrade.

[Text deleted.]

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

To upgrade the facility for consolidated Pu storage, 1,142 workers would be needed during peak construction and 509 direct workers would be needed for operations. Some of the direct jobs during both phases would be

filled by in-migrating workers. The effects of this in-migration on the region's economy, employment, population, housing, community services, and local transportation are discussed below.

Regional Economy Characteristics. During peak construction of the facility, the REA's total employment would increase from the projected No Action employment by almost 1 percent. A total of 2,063 jobs (1,142 direct and 921 indirect) would be generated by constructing the facility. Unemployment would decrease from 4.8 percent to 4.2 percent. Per capita income would increase by less than 1 percent (Socio 1996a).

Operation of the facility would generate 2,295 jobs (509 direct and 1,786 indirect). Total employment in the region during full operation would increase approximately 1 percent over the No Action projection, and unemployment would decrease to 4.0 percent. Per capita income would increase by less than 1 percent (Socio 1996a).

Population and Housing. Some qualified workers would in-migrate to the ROI during both the construction and operational phases. However, any population change in the region would be less than 1 percent and projected housing vacancies would be sufficient to accommodate the slight population growth (Socio 1996a).

Community Services. An increase in total ROI school enrollment of 251 during construction and 153 during operation of the facility would require 16 teachers above the No Action level during construction and 9 additional teachers during full operations in order to maintain the No Action level of service (Socio 1996a). These increases represent the sum of changes across all the school districts in the ROI, and no single school district would be significantly affected.

The police force in the ROI would need to expand by two officers during both construction and operation in order to maintain the No Action level of service. The additional population resulting from construction would require three firefighters over No Action, while additional population during operations would require only two additional firefighters (Socio 1996a).

Hospital occupancy rates would increase slightly over No Action projections, but available hospital capacity would be able to absorb this increase. Population increases would require three additional physicians during construction and two additional physicians during both construction and operations to maintain the No Action level of service (Socio 1996a).

Local Transportation. During peak construction, workers would generate 2,193 vehicle trips per day. This increase would cause a drop in level of service on two local road segments. Farm-to-Market Road 683 from U.S. 60 to Farm-to-Market Road 293, a rural two lane highway, would experience a drop in level of service from A to B. I-27 from Local Route 335 at Amarillo to I-40 at Amarillo would experience a drop in level of service from D to E.

During operations, workers would generate 977 vehicle trips per day. This increase would not affect the level of service on the local road segments analyzed (Socio 1996a).

Construct New Plutonium Storage Facility

The new consolidated Pu storage facility would generate over 2,000 jobs (direct and indirect) during peak construction and over 2,100 jobs during operation. Many of the direct jobs during both construction and operation of the new facility would be expected to be filled by in-migrating workers. The effects of this in-migration on the region's economy, employment, population, housing, community services, and local transportation are discussed below.

Regional Economy Characteristics. A total of 2,067 jobs (1,144 direct and 923 indirect) would be generated during construction. Total employment in the REA would increase by almost 1 percent over the No Action projection as a result of construction activities. Unemployment would decrease from the No Action projection of

4.8 percent to 4.2 percent. Per capita income would increase by much less than 1 percent over the No Action projection.

Operation of the consolidated storage facility at Pantex would generate 2,133 jobs (471 direct and 1,660 indirect) during full operation, increasing total employment in the REA by approximately 1 percent over the No Action projection. Unemployment would decrease to 4.1 percent. Per capita income would increase by less than 1 percent over the No Action projection (Socio 1996a).

Population and Housing. Project workers and their families would be expected to in-migrate to the ROI to fill direct jobs created by construction and operation of the storage facility. However, the ROI population is expected to increase by less than 1 percent over No Action projections during both construction and operation, and projected housing vacancies would accommodate the increased demand (Socio 1996a).

Community Services. The in-migration of approximately 1,384 persons during construction and 762 persons during full operation of the facility would slightly increase the demand for community services. Although school enrollments would increase by less than 1 percent over the projected No Action levels during both construction and full operation, additional teachers would be needed to maintain the No Action level of service. The total number of teachers in the ROI would need to increase by 16 during construction and 8 during operation in order to maintain the No Action level of service (Socio 1996a).

The number of sworn police officers would need to increase by two over No Action projections during construction and by one during operation in order to maintain the No Action service level. Additionally, to maintain the No Action service level of fire protection, the number of firefighters would need to increase by three during construction and one during operations (Socio 1996a).

Hospital occupancy rates during construction and full operation would be slightly higher than the projected No Action rates, but existing capacity would be able to absorb the increase. The number of physicians in the ROI would need to increase by two during construction and by one during full operation in order to maintain the No Action service level (Socio 1996a).

Local Transportation. During peak construction, workers would generate 2,196 vehicle trips per day. This increase would cause a drop in level of service on two local road segments. Farm-to-Market Road 683 from U.S. 60 to Farm-to-Market Road 293, a rural two lane highway, would experience a drop in level of service from A to B. I-27 from Local Route 335 at Amarillo to I-40 at Amarillo would experience a drop in level of service from D to E. Operation workers would generate 908 vehicle trips per day and this increase would not affect the level of service on the local road segments analyzed (Socio 1996a).

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction of new storage facilities would be required in order to store Pu and HEU at Pantex. Projections indicate that workers would in-migrate to fill some of the direct jobs generated during both the construction and operation phases at Pantex. However, there would be sufficient labor available in the REA to fill the indirect jobs created during both periods. The effects on the region's economy, population, housing, community services, and local transportation are discussed below.

Regional Economy Characteristics. Construction of the consolidated Pu and HEU storage facilities would generate a total of 2,125 jobs (1,176 direct and 949 indirect) in the REA during peak construction at Pantex. Projections indicate that the available labor force would fill all the indirect jobs created, but approximately 558 in-migrant workers would be needed to fill the direct labor requirements. Total employment in the REA would increase 1.0 percent over No Action projections, and unemployment would decrease from 4.8 percent to 4.2 percent. Per capita income would increase less than 1 percent (Socio 1996a).

Operation of the proposed storage facilities would generate a total of 2,710 jobs (601 direct and 2,109 indirect) in the REA. While some specialized direct jobs would be filled by in-migrating workers, all of the indirect positions would be filled by available labor in the region. Total employment in the REA would increase 1.2 percent over the No Action projection, and the REA unemployment rate would decrease to 3.9 percent. Per capita income would increase by less than 1 percent (Socio 1996a).

Population and Housing. Approximately 1,468 and 1,070 persons are projected to in-migrate to the region during the construction and operation phases of the proposed storage facilities, respectively (Socio 1996a). Projected housing vacancies would be sufficient to accommodate the increase in demand for housing units.

Community Services. The in-migration of population during both the construction and operation phases of the proposed alternative would slightly increase the demand for community services. ROI school enrollments are projected to increase by 269 and 196 students during peak construction and at full operation, respectively. In order to maintain the No Action level of service, the number of teachers would need to increase by 17 during construction and 11 during full operation of the proposed facility (Socio 1996a).

During both peak construction and full operation, the number of sworn police officers would need to increase by two in order to maintain the No Action level of service. [Text deleted.] In order to maintain the No Action service level of 2.0 firefighters per 1,000 persons, the number of firefighters would need to increase by four during peak construction and by two during full operation (Socio 1996a).

Projected hospital occupancy rates, during peak construction and full operation, would be slightly higher than the No Action projections, but existing capacity would be able to accommodate the increase. The number of physicians in the ROI would need to increase by two during both peak construction and full operation in order to maintain the No Action service level (Socio 1996a).

Local Transportation. During peak construction, workers would generate 2,258 vehicle trips per day. This increase would cause a drop in level of service on two local road segments. Farm-to-Market Road 683 from U.S. 60 to Farm-to-Market Road 293, a rural two lane highway, would experience a drop in level of service from A to B. I-27 from Local Route 335 at Amarillo to I-40 at Amarillo would experience a drop in level of service from D to E. Operation employees would generate 1,154 vehicle trips per day. This increase would not affect the level of service on the local road segments analyzed (Socio 1996a).

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Not including the strategic reserve and weapons R&D materials in the storage options would slightly reduce the number of employees needed during operations. Fewer workers would in-migrate, and the increase in demand for housing and community services would be smaller. A smaller workforce would still benefit the regional economy, but on a smaller scale than if the larger facility was constructed for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

Phaseout of existing Pu storage facilities at Pantex would result in a loss of five operational employees. Some of these positions would likely be transferred to other onsite activities, reducing the impact of a storage facility phaseout. At maximum, phaseout would result in a total loss of 28 direct and indirect jobs within the region, but decreases to regional employment and income would be imperceptible. In the longer term, some displaced workers would be expected to leave the region to seek other employment opportunities. However, any resulting decreases in population would be negligible.

Phaseout of the existing Pu storage facilities at Pantex would slightly reduce the number of vehicle trips per day generated by site workers. There would be no significant traffic impact to the local road network due to this alternative.

4.2.4.9 Public and Occupational Health and Safety

The assessments of potential radiological and chemical impacts associated with the storage alternatives at Pantex are presented in this section. Summaries of radiological impacts from normal operations are presented in Tables 4.2.4.9–1 and 4.2.4.9–2 for the public and workers, respectively. Impacts from the hazardous chemicals are presented in Table 4.2.4.9–3. Summaries of impacts associated with postulated accidents are given in Tables 4.2.4.9–4 through 4.2.4.9–8. Detailed results are presented in Appendix M.

Aircraft Crash. Pantex is located approximately 13.6 km (8.5 mi) from the northeast-southwest runway at Amarillo International Airport. Potential accident scenarios in which an aircraft crashes into one or more facilities at Pantex have been developed for the Pantex EIS. A discussion of aircraft crash accident for this PEIS is contained in Appendix R.

No Action Alternative

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from normal operations involved with the Pantex site-wide missions, including storage of Pu. The impacts would be within applicable regulatory limits. For facility accidents, the risks and consequences are described in site safety documentation.

Normal Operation. The current mission at Pantex, where Pu is in interim storage, is described in Section 3.5. The site has identified those facilities that will continue to operate under the No Action Alternative, including Pu storage facilities and others, if any, that will become operational by 2005. Based on that information, the radiological and chemical releases to the environment in 2005 and beyond (future operation) were developed and used in the impact assessments. The resulting doses and potential health effects to the public and workers at Pantex are described below.

Radiological Impacts. The calculated annual dose to the average and maximally exposed members of the public from total site operation; the associated fatal cancer risks to these individuals from 50 years of operation; the dose to the population within 80 km (50 mi) from total site operation in the year 2030; and the projected number of fatal cancers in this population from 50 years of operation are presented in Table 4.2.4.9–1 under this alternative at Pantex. The annual dose of 6.1×10^{-5} mrem to the MEI is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.5×10^{-9}. The annual dose of 2.8×10^{-4} person-rem to the population would be within the limit in proposed 10 CFR 834. The corresponding number of fatal cancers in this population from 50 years of operation would be 7.0×10^{-6}. To put operational dose impacts into perspective, comparisons with doses from natural background radiation are included in the table.

Under the No Action Alternative, as shown in Table 4.2.4.9–2, the annual average dose to a non-involved (No Action) site worker and the annual dose to the non-involved (No Action) total site workforce would be 10 mrem and 14 person-rem, respectively. The associated risk of fatal cancer to the average worker from 50 years of total site operations would be 2.0×10^{-4}, and the projected number of fatal cancers among all workers from 50 years of total site operations would be 0.28. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from the normal operation under this alternative at Pantex are presented in Table 4.2.4.9–3. The hazardous chemical impacts from current site operations were used to estimate the baseline site impacts for the various storage alternatives. The noncancer health effects expected and the risk of cancer due to the total chemical exposures were estimated for each site. Since the major releases due to normal operations at Pantex are expected to make up nearly all of the exposures

Table 4.2.4.9–1. Potential Radiological Impacts to the Public During Normal Operation at Pantex Plant—No Action and Storage Alternatives

Receptor	No Action		Upgrade		Consolidation				Collocation	
					New and Modify Zone 12 South		New Facility			
	Storage Facilities[a]	Total Site	Storage Facilities[b]	Total Site[c]	Storage Facilities	Total Site[c]	Storage Facility	Total Site[c]	Storage Facility	Total Site[c]
Annual Dose to the Maximally Exposed Individual Member of the Public[d]										
Atmospheric release pathway (mrem)	[e]	6.1×10^{-5}	[e]	$<6.1 \times 10^{-5}$	9.5×10^{-6}	6.5×10^{-5}	9.5×10^{-6}	6.5×10^{-5}	9.6×10^{-6}	6.5×10^{-5}
Drinking water pathway (mrem)	0	0	0	0	0	0	0	0	0	0
Total liquid release pathway (mrem)	0	0	0	0	0	0	0	0	0	0
Atmospheric and liquid release pathways combined (mrem)	1.8×10^{-8}[e]	6.1×10^{-5}	$<1.8 \times 10^{-8}$[e]	6.1×10^{-5}	9.5×10^{-6}	6.5×10^{-5}	9.5×10^{-6}	6.5×10^{-5}	9.6×10^{-6}	6.5×10^{-5}
Percent of natural background[f]	5.4×10^{-9}	1.8×10^{-5}	$<5.4 \times 10^{-9}$	$<1.8 \times 10^{-5}$	2.8×10^{-6}	1.9×10^{-5}	2.8×10^{-6}	1.9×10^{-5}	2.9×10^{-6}	1.9×10^{-5}
50-year fatal cancer risk	4.5×10^{-13}	1.5×10^{-9}	$<4.5 \times 10^{-13}$	$<1.5 \times 10^{-9}$	2.4×10^{-10}	1.6×10^{-9}	2.4×10^{-10}	1.6×10^{-9}	2.4×10^{-10}	1.6×10^{-9}
Population Dose Within 80 Kilometers for Year 2030[g]										
Atmospheric release pathway (person-rem)	[e]	2.8×10^{-4}	[e]	$<2.8 \times 10^{-4}$	5.5×10^{-5}	3.3×10^{-4}	5.2×10^{-5}	3.3×10^{-4}	5.3×10^{-5}	3.3×10^{-4}
Total liquid release pathway (person-rem)	0	0	0	0	0	0	0	0	0	0
Atmospheric and liquid release pathways combined (person-rem)	6.3×10^{-6}[e]	2.8×10^{-4}	$<6.3 \times 10^{-6}$[e]	$<2.8 \times 10^{-4}$	5.5×10^{-5}	3.3×10^{-4}	5.2×10^{-5}	3.3×10^{-4}	5.3×10^{-5}	3.3×10^{-4}
Percent of natural background[f]	5.4×10^{-9}	2.4×10^{-7}	$<5.4 \times 10^{-9}$	$<2.4 \times 10^{-7}$	4.7×10^{-8}	2.9×10^{-7}	4.4×10^{-8}	2.8×10^{-7}	4.5×10^{-8}	2.8×10^{-7}
50-year fatal cancers	1.6×10^{-7}	7.0×10^{-6}	$<1.6 \times 10^{-7}$	$<7.0 \times 10^{-6}$	1.4×10^{-6}	8.4×10^{-6}	1.3×10^{-6}	8.3×10^{-6}	1.3×10^{-6}	8.3×10^{-6}

Table 4.2.4.9–1. Potential Radiological Impacts to the Public During Normal Operation at Pantex Plant—No Action and Storage Alternatives—Continued

	No Action		Upgrade		Consolidation				Collocation	
					New and Modify Zone 12 South		New Facility			
Receptor	Storage Facilities[a]	Total Site	Storage Facilities[b]	Total Site[c]	Storage Facilities	Total Site[c]	Storage Facility	Total Site[c]	Storage Facility	Total Site[c]
Annual Dose to the Average Individual Within 80 Kilometers[h]										
Atmospheric and liquid release pathways combined (mrem)	1.8×10^{-8}	8.0×10^{-7}	$<1.8\times10^{-8}$	$<8.0\times10^{-7}$	1.6×10^{-7}	9.4×10^{-7}	1.5×10^{-7}	9.4×10^{-7}	1.5×10^{-7}	9.4×10^{-7}
50-year fatal cancer risk	4.5×10^{-13}	2.0×10^{-11}	$<4.5\times10^{-13}$	$<2.0\times10^{-11}$	3.9×10^{-12}	2.4×10^{-11}	3.7×10^{-12}	2.4×10^{-11}	3.8×10^{-12}	2.4×10^{-11}

[a] The committed effective dose equivalent for the storage facility is calculated based upon an analysis of measured dose.

[b] For the three upgrade subalternatives including the Preferred Alternative, the dose to the MEI and the population within 80 km would decrease slightly from the No Action Alternative, although the differences are expected to be below detection limits. Therefore, the total site dose would decrease slightly but the change would be undetectable. The quantity of Pu pits at Pantex to be stored in upgraded facilities in Zone 12 would be slightly increased by the addition of RFETS pits (the Preferred Alternative) or by the addition of RFETS Pu and LANL Pu. The difference between these three subalternatives would be below detection limits. The AT-400A has both an inner container and an outer container that provides additional shielding material. The overall effect of moving Pantex and RFETS pits from Zone 4 to upgraded Zone 12 storage facilities would be lower potential releases of radioactive materials to the public because the radiological impacts at Zone 4 would be reduced.

[c] Includes impacts from No Action facilities. The location of the MEI may be different under No Action than for the other alternatives. Therefore, the impacts may not be directly additive.

[d] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways as required by NESHAPS (40 CFR 61, Subpart H) under the CAA, 4 mrem per year from the drinking water pathway as required by the SWDA, and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[e] The atmospheric releases for No Action and upgrade would not be measurable above background radiation. The atmospheric and liquid release pathways combined was calculated with measured data from direct doses outside the facility.

[f] The annual natural background radiation level at Pantex is 334 mrem for the average individual; the population within 80 km in the year 2030 receives 116,900 person-rem.

[g] For DOE activities, proposed 10 CFR 834 (see 58 FR 16268) would generally limit the potential annual population dose to 100 person-rem from all pathways combined, and would require an ALARA program.

[Text deleted.]

[h] Obtained by dividing the population dose by the number of people projected to live within 80 km of Pantex in 2030 (350,000).

Source: Section M.2.

Table 4.2.4.9–2. Potential Radiological Impacts to Workers During Normal Operation at Pantex Plant—Storage Alternatives

Receptor	Upgrade[a] With RFETS Pits	Upgrade[a] Without RFETS or LANL Pu	Upgrade[a] With RFETS and LANL Pu	Consolidation[a] New and Modify Zone 12 South	Consolidation[a] New Facility	Collocation[a] New Facility
Involved Workforce[b]						
Average worker dose (mrem/yr)[c]	116	116	116	254	258	264
50-year risk of fatal cancer	2.3×10^{-3}	2.3×10^{-3}	2.3×10^{-3}	5.1×10^{-3}	5.2×10^{-3}	5.3×10^{-3}
Total dose (person-rem/yr)	3	3	6	31	24	25
50-year fatal cancers	0.06	0.06	0.12	0.62	0.48	0.50
Noninvolved Workforce[d]						
Average worker dose (mrem/yr)[c]	24	24	24	24	24	24
50-year risk of fatal cancer	4.8×10^{-4}	4.8×10^{-4}	4.8×10^{-4}	4.8×10^{-4}	4.8×10^{-4}	4.8×10^{-4}
Total dose (person-rem/yr)	34	34	34	34	34	34
50-year fatal cancers	0.68	0.68	0.68	0.68	0.68	0.68
Total Site Workforce[e]						
Dose (person-rem/yr)	37	37	40	65	58	59
50-year fatal cancers	0.74	0.74	0.80	0.90	0.76	0.78

[a] Under the Upgrade Alternative (either without RFETS or LANL Pu or with RFETS pits), 25 in-plant workers badged with dosimeters to monitor radiation exposure would be required to operate the storage facility, with an estimated additional 25 badged in-plant workers needed if Pu (pit and non-pit material) is transferred from RFETS and LANL. The impacts given in the Upgrade Alternative (with RFETS and LANL Pu) include those associated with these additional workers. The number of involved badged workers for the two Consolidation Alternatives would be 123 and 92; for the Collocation Alternative the number of badged workers would be 95.

[b] The involved worker is a worker associated with operations of the proposed action. The maximum dose to an involved worker would be kept below 500 mrem per year. [Text deleted.] An effective ALARA program will ensure that the exposure will be reduced to that level which is as low as reasonably achievable.

[c] The radiological limit for an individual worker is 5,000 mrem/year (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem per year (DOE 1992t); the site must make reasonable attempts to maintain worker doses below this level.

[d] The noninvolved worker is a worker onsite but not associated with operations of the proposed action. The projected number of noninvolved badged workers in 2005 is 1,400. The noninvolved workforce is equivalent to the No Action workforce.

[e] The impact to the total site workforce is the summation of the in-plant worker impact and the noninvolved worker impact.

[Text deleted.]

Source: PX 1996e:2; PX DOE 1996a; and Section M.2.

to onsite workers and to the public in adjacent communities, contributions to the hazardous chemical concentrations from all other sources (for example, industrial operations) are considered negligible for purposes of risk calculations.

The HI to the MEI of the public at Pantex resulting from normal operation under the No Action Alternative is 5.7×10^{-3}, and the cancer risk is 1.1×10^{-8}. The HI to the onsite worker is 6.1×10^{-3}, and the cancer risk is 4.5×10^{-7}.

Facility Accidents. Under the No Action Alternative, Pu would continue to be stored at Pantex in existing facilities. These facilities currently operate in accordance with DOE safety orders which ensure that the risk to the public of prompt fatalities due to accidents or cancer fatalities due to operations will be minimized. The safety to workers and the public from accidents at existing facilities is also controlled by Technical Safety Requirements specified in detail in SARs or a Basis for Interim Operations document prepared and maintained specifically for a facility or process within a facility. Under these controls, any change in approved operations or to facilities would cause a halt in operations until it can be established that worker and public safety has not been compromised.

Table 4.2.4.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation at Pantex Plant—No Action and Storage Alternatives

	No Action	Upgrade[a]		Consolidation		Collocation	
Receptor	Total Site[b]	Facility[c]	Total Site[b]	Facility[c]	Total Site[b]	Facility[c]	Total Site[b]
Maximally Exposed Individual (Public)							
Hazard index[d]	5.7×10^{-3}	0	5.7×10^{-3}	1.4×10^{-4}	5.8×10^{-3}	2.0×10^{-4}	5.9×10^{-3}
Cancer risk[e]	1.1×10^{-8}	0	1.1×10^{-8}	1.5×10^{-7}	1.6×10^{-7}	1.5×10^{-7}	1.6×10^{-7}
Worker Onsite							
Hazard index[f]	6.1×10^{-3}	0	6.1×10^{-3}	7.0×10^{-4}	6.8×10^{-3}	9.3×10^{-4}	7.1×10^{-3}
Cancer risk[g]	4.5×10^{-7}	0	4.5×10^{-7}	6.2×10^{-6}	6.7×10^{-6}	6.2×10^{-6}	6.7×10^{-6}

[a] Chemical impacts are the same for all three upgrade subalternatives.
[b] Total=Sum of the No Action plus the contributions of the above facility.
[c] Contribution from the above activity only (that is, the amount of increase over the existing No Action level at the site).
[d] Hazard index for MEI=Sum of the individual Hazard Quotients (noncancer health effects) for MEI.
[e] Cancer risk for MEI=(Emissions for 8-hour) x (0.286 [converts concentrations to doses]) x (slope factor [SF]).
[f] Hazard index for workers=Sum of individual Hazard Quotients (noncancer health effects) for workers.
[g] Cancer risk for workers=(Emissions for 8-hour) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (SF).
Note: Where there are no known carcinogens among the hazardous chemicals emitted, there are no slope factors, therefore the calculated cancer risk value is 0.
Source: Section M.3; Tables M.3.4–14 through M.3.4–17.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the modified existing Pu storage facilities under the Upgrade Alternative at Pantex. The section describes the impacts from normal facility operations at Pantex, then describes impacts from facility accidents.

During normal operation at Pantex, the operation of the Pu storage facilities under this alternative would result in impacts that are within applicable regulatory limits. Storage of RFETS pits would occur in Zone 4 until Zone 12 facilities are available for the Preferred Alternative. The radiological impacts for intersite transportation between Zone 4 and Zone 12, the repackaging from FL(B) into AL-R8 containers, and the storage in Zone 4 of pits from RFETS are described in Appendix Q.

[Text deleted.]

Normal Operation. There would be no radiological releases during the modification of existing storage facilities at Pantex. Construction worker exposures to materials potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct exposures. The resulting doses and potential health effects to the public and workers at Pantex are described below.

Radiological Impacts. The dose to the public would be reduced slightly from the No Action Alternative for the Upgrade With RFETS Pu Pits Subalternative, as shown in Table 4.2.4.9–1. The number of pits at Pantex to be

stored in upgraded facilities in Zone 12 South would be slightly increased by the addition of RFETS pits. However, before the material would be placed in facilities in Zone 12, pits would be repackaged from AL-R8 containers into AT-400A containers. The AT-400A has both an inner container (which is welded and prevents the release of any radioactive materials) and an outer container (which also prevents the release of radioactive materials and provides additional shielding material). The upgraded storage facilities in Zone 12 would have improved safety and design features over those in Zone 4, including filters to reduce the possibility of airborne releases to the atmosphere. Therefore, the overall effect of moving Pantex and RFETS pits into upgraded Zone 12 storage facilities would be lower potential releases of radioactive materials to the public.

Doses to onsite workers from normal operations are given in Table 4.2.4.9–2. Included in the table are involved workers directly associated with the storage facilities, workers who are not involved with these facilities, and the entire workforce at Pantex. All doses would fall within regulatory limits and administrative control levels. The total dose to the involved workforce would be 3 person-rem/year, and for 50 years of operation the fatal cancers would be 0.06.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the modified facilities under the Upgrade Alternative at Pantex are presented in Table 4.2.4.9–3. The impacts from all site operations, including the storage facilities, are included in this table. Total site impacts, which include the No Action impact plus the facilities, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public would be zero (because no hazardous substances would be released), and the cancer risk would be zero (because no carcinogens would be released) as a result of operation of the storage facilities under the Upgrade Alternative in the year 2030. The HI and cancer risk from hazardous chemicals would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the storage facilities, would result in an HI of 5.7×10^{-3} and a cancer risk of 1.1×10^{-8} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be zero (because no hazardous substances would be released), and the cancer risk is zero (because no carcinogens would be released from the hazardous chemicals used) as a result of operation of the storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures are expected to remain the same. The total site operation, including the storage facilities, would result in an HI of 6.1×10^{-3} and a cancer risk of 4.5×10^{-7} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents have been postulated for the Upgrade With RFETS Pu Pits Subalternative facility for which there may be releases of Pu that may impact onsite workers and the offsite population. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.4.9–4. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.26 at Pantex for the beyond design basis earthquake accident scenario with a probability of 1.0×10^{-7} per year. The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 1.3×10^{-6}, 8.4×10^{-9}, and 2.3×10^{-8}, respectively. The maximum population 50-year facility lifetime risk would be 8.8×10^{-4} (that is, one fatality in about 57,000 years) at Pantex for the PCV penetration accident scenario with a probability of 0.04 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 5.8×10^{-6} and 1.4×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenario identified in Table 4.2.4.9–4.

Table 4.2.4.9–4. Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative—Accident Impacts at Pantex Plant

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	5.3×10^{-8}	1.8×10^{-6}	2.1×10^{-8}	7.1×10^{-7}	3.2×10^{-6}	1.1×10^{-4}	6.0×10^{-4}
PCV breach by firearms discharge	3.1×10^{-9}	1.8×10^{-7}	1.2×10^{-9}	7.1×10^{-8}	1.9×10^{-7}	1.1×10^{-5}	3.5×10^{-4}
PCV penetration by corrosion	1.4×10^{-5}	7.2×10^{-6}	5.8×10^{-6}	2.9×10^{-6}	8.8×10^{-4}	4.4×10^{-4}	0.04
Vault fire	1.2×10^{-8}	2.4×10^{-3}	4.7×10^{-9}	9.4×10^{-4}	7.2×10^{-7}	0.14	1.0×10^{-7}
Truck bay fire	1.2×10^{-9}	2.5×10^{-4}	4.9×10^{-10}	1.0×10^{-4}	7.6×10^{-8}	0.015	1.0×10^{-7}
Spontaneous combustion	1.2×10^{-11}	3.5×10^{-7}	4.9×10^{-12}	1.4×10^{-7}	7.6×10^{-10}	2.2×10^{-5}	7.0×10^{-7}
Explosion in the vault	1.8×10^{-9}	3.6×10^{-4}	7.2×10^{-10}	1.4×10^{-4}	1.1×10^{-7}	0.023	1.0×10^{-7}
Explosion outside of vault	1.3×10^{-11}	2.7×10^{-6}	5.3×10^{-12}	1.1×10^{-6}	8.2×10^{-10}	1.6×10^{-4}	1.0×10^{-7}
Nuclear criticality	9.7×10^{-12}	1.9×10^{-6}	4.6×10^{-12}	9.3×10^{-7}	1.2×10^{-10}	2.3×10^{-5}	1.0×10^{-7}
Beyond evaluation basis earthquake	2.3×10^{-8}	4.7×10^{-3}	8.4×10^{-9}	1.7×10^{-3}	1.3×10^{-6}	0.26	1.0×10^{-7}
Expected risk[d]	1.4×10^{-5}	–	5.8×10^{-6}	–	8.8×10^{-4}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the impacts in Table 4.2.4.9–7 with adjustments to reflect smaller quantities of Pu for upgraded storage.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. Because the facilities will be modified, design information necessary to support a reasonable estimate of the accident impacts to the involved workers is not yet available. Such information would specify the locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details that affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Before modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

During normal operation, there would be a slight reduction in radiological and hazardous chemical impacts from the Upgrade With RFETS Pits Subalternative if no RFETS or LANL Pu is moved to Pantex. The radiation impacts during normal operations to the public and workers are shown Tables 4.2.4.9–1 and 4.2.4.9–2, respectively. The doses to the public and workers for upgrade without RFETS Pu or LANL Pu is shown together

with the doses to the public and workers for upgrade with RFETS pits because this reduction in dose to the public and workers would not be measurable above background. The chemical impacts to the public and workers are shown in Table 4.2.4.9–3 and would not be detectable from the impacts for an upgrade facility with RFETS pits. For facility accidents, the impacts without RFETS Pu or LANL Pu would be slightly reduced from the impacts shown in Table 4.2.4.9–4 because of the smaller amount of Pu material. This reduction in potential impacts would not be detectable or measurable above background.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. Because the facilities will be modified, design information necessary to support a reasonable estimate of the accident impacts to the involved workers is not yet available. Such information would specify the locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details that affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Before modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

During normal operation, there would be a slight increase in radiological and hazardous chemical impacts from the Upgrade With RFETS Pits Subalternative if all of the RFETS and LANL Pu is moved to Pantex. The radiation impacts during normal operations to the public and workers are shown Tables 4.2.4.9–1 and 4.2.4.9–2, respectively. The doses to the public for upgrade with all the RFETS Pu and LANL Pu are shown together with the doses to the public and workers for upgrade with RFETS pits because the difference in the dose to the public would not be measurable above background. The doses to the workers with all the RFETS Pu and LANL Pu would be increased to 6 person-rem/year. The increase would be because the non-pit material would require additional handling not currently performed at Pantex. The chemical impacts to the public and workers are shown in Table 4.2.4.9–3 and would not be detectable from the impacts for an upgrade facility with RFETS pits. For facility accidents, the impacts with all RFETS Pu and LANL Pu would be increased above the impacts shown in Tables 4.2.4.9–5 and 4.2.4.9–6 because the non-pit material would require additional handling and operations not currently performed at Pantex.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. Because the facilities will be modified, design information necessary to support a reasonable estimate of the accident impacts to the involved workers is not yet available. Such information would specify the locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details that affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Before modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

[Text deleted.]

Consolidation Alternative

This section includes a description of radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with new or modified consolidated Pu storage

facilities at Pantex. Normal operation under either of the two consolidated storage options would result in impacts that are within applicable regulatory limits.

[Text deleted.]

Construct New and Modify Existing Zone 12 South Facilities

Normal Operation. There would be no radiological releases from constructing a new storage facility or from modifying existing storage facilities to store the consolidated Pu. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers at Pantex are described below for consolidated Pu storage in the modified storage facility.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new and modified Pu storage facilities at Pantex are presented in Table 4.2.4.9–1. The impacts from all site operations, including the storage facilities, are also given in the table. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The dose to the MEI from annual operations of the new and modified storage facilities would be 9.5×10^{-6} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 2.4×10^{-10}. The impacts to the average member of the public would be less. As a result of operations in the year 2030, the population dose would be 5.5×10^{-5} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 1.4×10^{-6}.

The dose to the MEI from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 6.5×10^{-5} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.6×10^{-9}. The impacts to the average member of the public would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 3.3×10^{-4} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 8.4×10^{-6}.

Doses to onsite workers from normal operations are given in Table 4.2.4.9–2. Included are involved workers directly associated with the new and modified storage facilities, workers who are not involved with these facilities, and the entire workforce at Pantex. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Doses to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemicals associated with constructing new and modifying existing facilities for the consolidation of Pu will be equal to, or less than, hazardous chemicals associated with operations under the Collocation Alternative for Pu storage. The resulting hazardous chemical impacts to the public and worker will be equal to, or less than, those appearing in Table 4.2.4.9–3 for the collocation of Pu.

Facility Accidents. A set of potential accidents have been postulated for the upgrade of existing and construction of new storage facilities at Pantex for which there may be releases of Pu that may impact onsite workers and the offsite population. The accident consequences and risks to a worker located 1,000 m (3,280 ft)

from the accident release point, the maximum offsite individual located at the site boundary, and the general population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.4.9–5 for the Surplus Materials Storage Building and in Table 4.2.4.9–6 for the Strategic Reserves Storage Building. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.29 at the Pantex Surplus Materials Storage Buildings for the vault fire accident scenario with a probability of $1x10^{-7}$ per year. The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be $1.5x10^{-6}$, $1.1x10^{-8}$ and $2.9x10^{-8}$, respectively. The maximum population 50-year facility lifetime risk would be $1.8x10^{-3}$ (that is, one fatality in about 28,000 years) at the Pantex Surplus Material Storage Building for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be $1.3x10^{-5}$ and $3.2x10^{-5}$, respectively. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 1.8 at the Pantex Strategic Reserves Storage Building for the vault fire accident with a probability of $1x10^{-7}$ per year. The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be $9.0x10^{-6}$, $7.6x10^{-8}$ and $2.2x10^{-7}$, respectively. The maximum population 50-year facility lifetime risk would be $1.8x10^{-3}$ at the Pantex Strategic Reserves Storage Building for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be $1.3x10^{-5}$ and $3.2x10^{-5}$, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Tables 4.2.4.9–5 and 4.2.4.9–6.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities to workers close to the accident. Before construction of a new or modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Construct New Plutonium Storage Facility

Normal Operation. There would be no radiological releases during the construction of a new consolidated Pu storage facility at Pantex. Construction worker exposures to material potentially contaminated with radioactivity would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers at Pantex are described below for consolidated Pu storage in the new storage facility.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new consolidated Pu storage facility are presented in Table 4.2.4.9–1. The impacts from all site operations, including the new consolidated storage facility, are also given in the table. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The dose to the MEI from annual storage plant operation would be $9.5x10^{-6}$ mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be $2.4x10^{-10}$. The impacts to the average member of the public would be less. As a result of storage plant operation in the year 2030, the population dose would be $5.2x10^{-5}$ person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be $1.3x10^{-6}$.

Table 4.2.4.9–5. Consolidated Storage for Pantex Plant Surplus Materials Storage Building—Accident Impacts

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality (per 50 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality (per 50 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatalities (per 50 yr)[a]**	**Number of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
PCV puncture by forklift	7.3×10^{-8}	2.4×10^{-6}	2.9×10^{-8}	9.7×10^{-7}	4.2×10^{-6}	1.4×10^{-4}	6.0×10^{-4}
PCV breach by firearms discharge	4.3×10^{-9}	2.4×10^{-7}	1.7×10^{-9}	9.7×10^{-8}	2.2×10^{-7}	1.4×10^{-5}	3.5×10^{-4}
PCV penetration by corrosion	3.2×10^{-5}	1.0×10^{-5}	1.3×10^{-5}	4.0×10^{-6}	1.8×10^{-3}	5.7×10^{-4}	0.064
Vault fire	2.9×10^{-8}	5.7×10^{-3}	1.1×10^{-8}	2.1×10^{-3}	1.5×10^{-6}	0.29	1.0×10^{-7}
Truck bay fire	1.7×10^{-9}	3.5×10^{-4}	6.9×10^{-10}	1.4×10^{-4}	1.0×10^{-7}	0.021	1.0×10^{-7}
Spontaneous combustion	1.7×10^{-11}	4.9×10^{-7}	6.8×10^{-12}	1.9×10^{-7}	9.8×10^{-10}	2.8×10^{-5}	7.0×10^{-7}
Explosion in the vault	4.0×10^{-9}	8.1×10^{-4}	1.6×10^{-9}	3.2×10^{-4}	2.3×10^{-7}	0.046	1.0×10^{-7}
Explosion outside of vault	1.7×10^{-11}	3.5×10^{-6}	6.9×10^{-12}	1.4×10^{-6}	1.0×10^{-9}	2.0×10^{-4}	1.0×10^{-7}
Nuclear criticality	9.9×10^{-12}	1.9×10^{-6}	4.6×10^{-12}	9.3×10^{-7}	1.1×10^{-10}	2.1×10^{-5}	1.0×10^{-7}
Beyond evaluation basis earthquake	1.8×10^{-8}	3.6×10^{-3}	7.0×10^{-9}	1.4×10^{-3}	1.0×10^{-6}	0.20	1.0×10^{-7}
Expected risk[d]	3.2×10^{-5}	-	1.3×10^{-5}	-	1.9×10^{-3}	-	-

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

Source: Calculated using the source terms in Tables M.5.2.5.1–5 and M.5.2.5.1–6 and the MACCS computer code.

Table 4.2.4.9–6. Consolidated Storage for Pantex Plant Strategic Reserves Storage Building—Accident Impacts

Accident Description	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		Accident Frequency (per yr)
	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	
PCV puncture by forklift	7.3×10^{-8}	2.4×10^{-6}	3.0×10^{-8}	9.9×10^{-7}	4.2×10^{-6}	1.4×10^{-4}	6.0×10^{-4}
PCV breach by firearms discharge	4.3×10^{-9}	2.4×10^{-7}	1.7×10^{-9}	9.9×10^{-8}	2.5×10^{-7}	1.4×10^{-5}	3.5×10^{-4}
PCV penetration by corrosion	3.2×10^{-5}	1.0×10^{-5}	1.3×10^{-5}	4.1×10^{-6}	1.8×10^{-3}	5.7×10^{-4}	0.064
Vault fire	2.2×10^{-7}	0.043	7.6×10^{-8}	0.015	9.0×10^{-6}	1.8	1.0×10^{-7}
Truck bay fire	1.7×10^{-9}	3.5×10^{-4}	7.0×10^{-10}	1.4×10^{-4}	1.0×10^{-7}	0.021	1.0×10^{-7}
Spontaneous combustion	1.7×10^{-11}	4.9×10^{-7}	6.9×10^{-12}	2.0×10^{-7}	9.8×10^{-10}	2.8×10^{-5}	7.0×10^{-7}
Explosion in the vault	5.2×10^{-9}	1.0×10^{-3}	2.1×10^{-9}	4.2×10^{-4}	3.0×10^{-7}	0.059	1.0×10^{-7}
Explosion outside of vault	1.7×10^{-11}	3.5×10^{-6}	7.0×10^{-12}	1.4×10^{-6}	1.0×10^{-9}	2.0×10^{-4}	1.0×10^{-7}
Nuclear criticality	9.7×10^{-12}	1.9×10^{-6}	4.7×10^{-12}	9.4×10^{-7}	1.1×10^{-10}	2.1×10^{-5}	1.0×10^{-7}
Beyond evaluation basis earthquake	4.0×10^{-8}	8.0×10^{-3}	1.5×10^{-8}	2.9×10^{-3}	2.1×10^{-6}	0.41	1.0×10^{-7}
Expected risk[d]	3.2×10^{-5}	-	1.3×10^{-5}	-	1.9×10^{-3}	-	-

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

Source: Calculated using the source terms in Tables M.5.2.5.1–7 and M.5.2.5.1–8 and the MACCS computer code.

The dose to the MEI from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5 and would be 6.5×10^{-5} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.6×10^{-9}. The impacts to the average member of the public would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 3.3×10^{-4} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 8.3×10^{-6}.

Facility and total site doses to onsite workers from normal operations are given in Table 4.2.4.9–2. Included are involved workers directly associated with the new consolidated storage facility, workers who are not involved with the new storage facility, and the entire workforce at Pantex. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the new consolidated Pu storage facility at Pantex are presented in Table 4.2.4.9–3. The impacts from all site operations, including the consolidated storage facility, are included in this table. Total site impacts, which include the No Action impact plus the facility, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 1.4×10^{-4}, and the cancer risk is 1.5×10^{-7} as a result of operation of the new consolidated Pu storage facility in the year 2030. The HI and cancer risk from hazardous chemicals would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the upgrade facility, would result in an HI of 5.8×10^{-3} and a cancer risk of 1.6×10^{-7} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 7.0×10^{-4}, and the cancer risk is 6.2×10^{-6} as a result of operation of the new consolidated Pu storage facility in the year 2030. The HI and cancer risk from hazardous chemicals would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in an HI of 6.8×10^{-3} and a cancer risk of 6.7×10^{-6} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents have been postulated for a new consolidated storage facility for which there may be releases of Pu that may impact onsite workers and the offsite population. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.4.9–7. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.41 at Pantex for the beyond design basis earthquake accident scenario with a probability of 1.0×10^{-7} per year. The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 2.1×10^{-6}, 1.4×10^{-8}, and 3.7×10^{-8} respectively. The maximum population 50-year facility lifetime risk would be 1.4×10^{-3} (that is, one fatality in about 36,000 years) at Pantex for the PCV penetration accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 9.2×10^{-6} and 2.3×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.4.9–7.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of

Table 4.2.4.9–7. Consolidation Alternative Accident Impacts at Pantex Plant

Accident Description	Worker at 1,000 m: Risk of Cancer Fatality (per 50 yr)[a]	Worker at 1,000 m: Probability of Cancer Fatality[b]	Maximum Offsite Individual: Risk of Cancer Fatality (per 50 yr)[a]	Maximum Offsite Individual: Probability of Cancer Fatality[b]	Population to 80 km: Risk of Cancer Fatalities (per 50 yr)[a]	Population to 80 km: Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	5.3×10^{-8}	1.8×10^{-6}	2.1×10^{-8}	7.1×10^{-7}	3.2×10^{-6}	1.1×10^{-4}	6.0×10^{-4}
PCV breach by firearms discharge	3.1×10^{-9}	1.8×10^{-7}	1.2×10^{-9}	7.1×10^{-8}	1.9×10^{-7}	1.1×10^{-5}	3.5×10^{-4}
PCV penetration by corrosion	2.3×10^{-5}	7.2×10^{-6}	9.2×10^{-6}	2.9×10^{-6}	1.4×10^{-3}	4.4×10^{-4}	0.064
Vault fire	1.9×10^{-8}	3.8×10^{-3}	7.5×10^{-9}	1.5×10^{-3}	1.1×10^{-6}	0.23	1.0×10^{-7}
Truck bay fire	1.2×10^{-9}	2.5×10^{-4}	4.9×10^{-10}	1.0×10^{-4}	7.6×10^{-8}	0.015	1.0×10^{-7}
Spontaneous combustion	1.2×10^{-11}	3.5×10^{-7}	4.9×10^{-12}	1.4×10^{-7}	7.6×10^{-10}	2.2×10^{-5}	7.0×10^{-7}
Explosion in the vault	2.9×10^{-9}	5.8×10^{-4}	1.2×10^{-9}	2.3×10^{-4}	1.8×10^{-7}	0.036	1.0×10^{-7}
Explosion outside of vault	1.3×10^{-11}	2.7×10^{-6}	5.3×10^{-12}	1.1×10^{-6}	8.2×10^{-10}	1.6×10^{-4}	1.0×10^{-7}
Nuclear criticality	9.7×10^{-12}	1.9×10^{-6}	4.6×10^{-12}	9.3×10^{-7}	1.2×10^{-10}	2.3×10^{-5}	1.0×10^{-7}
Beyond evaluation basis earthquake	3.7×10^{-8}	7.5×10^{-3}	1.4×10^{-8}	2.7×10^{-3}	2.1×10^{-6}	0.41	1.0×10^{-7}
Expected risk[d]	2.3×10^{-5}	–	9.3×10^{-6}	–	1.4×10^{-3}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.1.1–5 and M.5.2.1.1–6 and the MACCS computer code.

worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities to workers close to the accident. Before construction of a new or modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

This section includes a description of radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the consolidation of Pu storage and collocation with HEU storage facilities at Pantex. This storage would take place in a new Pu and HEU storage facility.

Normal operation of the new collocated storage facility at Pantex would result in emissions that are within applicable regulatory limits.

[Text deleted.]

Normal Operation. There would be no radiological releases during the construction of a new collocated storage facility at Pantex. Construction worker exposures to material potentially contaminated with

radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored, as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers are described below.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new collocated storage facility at Pantex are presented in Table 4.2.4.9–1. The impacts from all site operations, including the new storage plant, are also given in the table. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The dose to the MEI from annual storage facility operation would be 9.6×10^{-6} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 2.4×10^{-10}. The impacts to the average member of the public would be less. As a result of storage facility operation in the year 2030, the population dose would be 5.3×10^{-5} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 1.3×10^{-6}.

The dose to the MEI from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR Part 61, Subpart H) and DOE Order 5400.5, and would be 6.5×10^{-5} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.6×10^{-9}. The impacts to the average member of the public would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 3.3×10^{-4} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 8.3×10^{-6}.

Doses to onsite workers from normal operations are given in Table 4.2.4.9–2. Included are involved workers directly associated with the new storage facility, workers who are not involved with the new storage facility, and the entire workforce at Pantex. All doses are within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of the facility.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the new consolidation of Pu and collocation with HEU storage facilities at Pantex are presented in Table 4.2.4.9–3. The impacts from all site operations, including the consolidation of Pu and collocation with HEU storage facilities, are also included in this table. Total site impacts which include the No Action impact plus the facility impacts, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 2.0×10^{-4} and the cancer risk is 1.5×10^{-7} as a result of operation of the new consolidation of Pu and collocation with HEU storage facilities in the year 2030. The HI and cancer risk from hazardous chemicals would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in an HI of 5.9×10^{-3} and a cancer risk of 1.6×10^{-7} for the onsite worker in the year 2030 and would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 9.3×10^{-4}, and the cancer risk is 6.2×10^{-6} as a result of operation of the new consolidation of Pu and collocation with HEU storage facilities in the year 2030. The HI and cancer risk from hazardous chemicals would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in a HI of 7.1×10^{-3},

and a cancer risk of 6.7×10^{-6} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents have been postulated for collocation of Pu and HEU for which there may be releases of Pu or HEU that may impact onsite workers and the offsite population. The consequences and risks of potential accidents that release both Pu and HEU would be bounded by the impacts associated with Pu. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.4.9–8. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.41 at Pantex for the beyond design basis earthquake accident scenario with a probability of 1.0×10^{-7} per year. The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 2.1×10^{-6}, 1.4×10^{-8}, and 3.7×10^{-8}, respectively. The maximum population 50-year facility lifetime risk would be 1.4×10^{-3} (that is, one fatality in about 36,000 years) at Pantex for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 9.2×10^{-6} and 2.3×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.4.9–8.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities to workers close to the accident. Before construction of a new or modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

If the strategic reserve and weapons R&D materials are not included, the impacts to the pubic and to workers from the accident-free storage activities would be reduced in proportion to the decrease in the amount of material stored. The impacts from total site operations would decrease slightly. This subalternative applies to the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. The risks due to accidents would also tend to be lower.

Phaseout

Normal Operation. A phaseout of existing Pu storage facilities at Pantex would reduce the impacts from radiological and chemical releases and exposures to levels slightly below the No Action levels. All workers involved in the transfer of the Pu from existing storage would be monitored to assure that their doses remain within regulatory limits and as low as reasonably achievable.

Facility Accidents. The phaseout operation will be conducted in accordance with DOE 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. For current operations in the facility that would be phased out, the safety of workers and the public from accidents is controlled by Technical Safety Requirements that are specified in SARs or Basis for Interim Operations documents that have been prepared for the facility. Prior to initiating phaseout, the potential for accidents that could impact workers and the public will be assessed and, if necessary, applicable existing safety documentation will be modified to ensure safety for workers and the public.

Table 4.2.4.9–8. Collocation Alternative Accident Impacts at Pantex Plant

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	5.3×10^{-8}	1.8×10^{-6}	2.1×10^{-8}	7.1×10^{-7}	3.2×10^{-6}	1.1×10^{-4}	6.0×10^{-4}
PCV breach by firearms discharge	3.1×10^{-9}	1.8×10^{-7}	1.2×10^{-9}	7.1×10^{-7}	1.9×10^{-6}	1.1×10^{-5}	3.5×10^{-4}
PCV penetration by corrosion	2.3×10^{-5}	7.2×10^{-6}	9.2×10^{-6}	2.9×10^{-6}	1.4×10^{-3}	4.4×10^{-4}	0.064
Vault fire	1.9×10^{-8}	3.8×10^{-3}	7.5×10^{-9}	1.5×10^{-3}	1.1×10^{-6}	0.23	1.0×10^{-7}
Truck bay fire	1.2×10^{-9}	2.5×10^{-4}	4.9×10^{-10}	1.0×10^{-4}	7.6×10^{-8}	0.015	1.0×10^{-7}
Spontaneous combustion	1.2×10^{-11}	3.5×10^{-7}	4.9×10^{-12}	1.4×10^{-7}	7.6×10^{-10}	2.2×10^{-5}	7.0×10^{-7}
Explosion in the vault	2.9×10^{-9}	5.8×10^{-4}	1.2×10^{-9}	2.3×10^{-4}	1.8×10^{-7}	0.036	1.0×10^{-7}
Explosion outside the vault	1.3×10^{-11}	2.7×10^{-6}	5.3×10^{-12}	1.1×10^{-6}	8.2×10^{-10}	1.6×10^{-4}	1.0×10^{-7}
Nuclear criticality	9.7×10^{-12}	1.9×10^{-6}	4.6×10^{-12}	9.3×10^{-7}	1.2×10^{-10}	2.3×10^{-5}	1.0×10^{-7}
Beyond evaluation basis earthquake	3.7×10^{-8}	7.5×10^{-3}	1.4×10^{-8}	2.7×10^{-3}	2.1×10^{-6}	0.41	1.0×10^{-7}
Expected risk[d]	2.3×10^{-5}	–	9.3×10^{-6}	–	1.4×10^{-3}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the MEI) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the 50-year lifetime of the facility.

All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.2.1–3 and M.5.2.2.1–4 and the MACCS computer code.

4.2.4.10 Waste Management

This section summarizes the impacts on waste management at Pantex under No Action and for each of the long-term storage alternatives to include the phaseout of Pu storage. There is no spent nuclear fuel or HLW associated with Pu or HEU storage. Table 4.2.4.10–1 lists the projected sitewide waste generation rates and treatment, storage, and disposal capacities under No Action for 2005. Projections for No Action were derived from the most recent available environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated are identifiable. The projection does not include wastes from future, yet uncharacterized, environmental restoration activities. The projections for No Action could change significantly depending on the decisions resulting from the PEIS on waste management being prepared by DOE or the Pantex EIS. Table 4.2.4.10–2 provides the estimated incremental operational waste volumes projected to be generated at Pantex as a result of the various storage alternatives prior to treatment. Some of the waste values described in this section are different than the waste values in the table. For those values that differ (for example, LLW), the table gives waste generated pre-treatment values and the text discusses post-treatment values (indicated as after treatment and volume reduction). The waste volumes generated from the various storage alternatives and the resultant waste effluent used for the waste impact analysis can be found in Section E.3.1. Facilities that would support the storage of Pu and/or HEU would treat and package all waste generated into forms that would enable staging and/or disposal in accordance with RCRA and other applicable statutes. Depending on decisions in waste-type-specific RODs for the Waste Management PEIS, wastes could be treated, and depending on the type of waste, disposed of onsite or at regionalized or centralized DOE sites. For the purposes of analyses only, this PEIS assumes that TRU and mixed TRU waste would be treated onsite to the current planning-basis WIPP WAC, and shipped to WIPP for disposal. This PEIS also assumes that LLW, mixed LLW, hazardous, and nonhazardous wastes would be treated and disposed of in accordance with current site practice.

No Action Alternative

Under this alternative, LLW, mixed LLW, hazardous, and nonhazardous waste would continue to be generated at Pantex from the missions outlined in Section 3.5. Pantex might also store, over the long term, certain quantities of pits from disassembled weapons, but minimal impacts on waste management is expected since such storage generates minimal additional waste.

Pantex's assembly/disassembly and HE programs would continue to generate low-level, mixed, hazardous, and nonhazardous wastes. Compactible components of solid LLW would continue to be processed at the onsite solid waste compaction facility. Mixed waste would be treated and disposed of according to the *Pantex Plant Federal Facility Compliance Act Site Treatment Plant/Compliance Plan* (September 1995) that was developed in accordance with the *Federal Facility Compliance Act*. Although the predominant workload in 1994 was disassembly operations, the activity levels were assumed to be representative of projected production levels that characterize No Action operations. It is expected that through waste minimization efforts generation rates would decrease.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Plutonium Pits Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The upgrading of the existing Pantex storage facility for the continued storage of Pu would have a small impact on existing Pantex waste management activities. Construction waste volumes for the upgraded facility with RFETS Pu pits are presented in Table E.3.1.1–7. Upgrading the existing storage would have minimal impact on Pantex waste management activities. Waste generated during construction would consist of wastewater and solid nonhazardous and hazardous wastes. Nonhazardous waste would be disposed of as part of the construction

Table 4.2.4.10–1. Projected Waste Management Under No Action (2005) at Pantex Plant

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	8[a]	Solidification onsite pending	12	Staged for processing	Varies[b]	None	NA
Solid	32[a]	Compaction	168	Staged for shipment	Included in liquid LLW	Ship offsite to NTS	NA
Mixed Low-Level							
Liquid	4[a]	None - onsite encapsulation pending	Planned	Staged for treatment in accordance with Pantex Site Treatment Plan	1,470[c]	None	NA
Solid	46[a]	Compaction and open burning (HE only)	Variable	Staged for treatment in accordance with Pantex Site Treatment Plan	Included in liquid mixed LLW	Offsite planned	NA
Hazardous							
Liquid[d]	2	Offsite	Variable	Staged for shipment	Included in liquid mixed LLW	Shipped offsite	NA
Solid	31	Open burning[e]	Variable	Staged for shipment	Included in liquid mixed LLW	Shipped offsite	NA
Nonhazardous (Sanitary)							
Liquid	141,000	Evaporation and filtration	898,000[f]	None	NA	Playa 1	898,000 m^3/yrf
Solid	339	Compaction	1,020	None	NA	Landfill (offsite)	NA

Table 4.2.4.10–1. Projected Waste Management Under No Action (2005) at Pantex Plant—Continued

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Nonhazardous (Other)							
Liquid	Included in sanitary	Carbon absorption/ filtration	Included in sanitary	None	NA	Playa 1 and 2	Included in sanitary
Solid	Included in sanitary	Compaction	Included in sanitary	None	NA	Landfill (onsite) construction debris only	Expandable

[a] Estimate based on extrapolation of Table 4.13.1.2–3 of the *Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE/EIS-0225D).

[b] Total amount of storage capacity available for LLW is a function of the percentage of total capacity currently occupied by hazardous wastes and mixed LLW.

[c] Operating capacity. Permitted storage can accommodate both LLW and mixed LLW.

[d] Includes solvent-contaminated wastewater, explosive-contaminated wastewater, and spent organic solvents contaminated with explosives.

[e] High explosive-contaminated wastes only. Open burning done in thermal treatment units on a per burn basis.

[f] Permit limit.

Note: NA=not applicable.

Source: DOE 1996b; PX 1995a:2; PX DOE 1995i; PX DOE 1996b

Table 4.2.4.10–2. Estimated Annual Generated Waste Volumes at Pantex Plant—No Action (2005) and Net Incremental for Storage Alternatives

		Upgrade			Consolidation			
Category	No Action[a] (m^3)	With RFETS Pu Pits[b] (m^3)	Without RFETS or LANL Pu[b] (m^3)	With RFETS and LANL Pu[b] (m^3)	Construct New and Modify Zone 12 South[b] (m^3)	New Facility[b] (m^3)	Collocation[b] (m^3)	Phaseout (m^3)
Transuranic								
Liquid	None	0	0	0.02[c]	0.02[c]	0.02[c]	0.02[c]	0
Solid	None	0.8	0.8	10	10	10	10	0
Mixed Transuranic								
Liquid	None	0	0	0	0	0	0	0
Solid	None	0	0	4	4	4	4	0
Low-Level								
Liquid	8	0.08[c]	0.08[c]	2[c]	2[c]	2[c]	2.1[c]	0
Solid	32	138	138	1,260	1,260	1,260	1,300	0
Mixed Low-Level								
Liquid	4	0.2	0.2	0.2	0.2	0.2	0.2	0
Solid	46	8	8	65	65	65	66	0
Hazardous								
Liquid	2	1	1	2	2	2	2	0
Solid	31	1.5	1.5	2	2	2	2	0
Nonhazardous (Sanitary)								
Liquid	141,000	12,900	12,900	109,500	109,500	97,800	129,500	0
Solid	339	275	275	1,560	1,560	1,440	1,840	0
Nonhazardous (Other)								
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	0
Solid	Included in sanitary	344[d]	344[d]	1,900[d]	1,900[d]	1,800[d]	2,300[d]	0

[a] The No Action waste volumes are from Table 4.2.4.10–1.

[b] Waste volumes for storage alternatives are found in Section E.3.1 (Tables E.3.1.1–3, E.3.1.1–7, E.3.1.2–5, E.3.1.2–6, and E.3.1.3–5). Waste effluents (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in these tables.

[c] Liquid TRU and LLW would be treated and solidified prior to disposal.

[d] Recyclable wastes.

project by the contractor, and the hazardous waste would be shipped offsite to commercial RCRA-permitted treatment and disposal facilities. Operational waste volumes, as shown in Table 4.2.4.10–2, would increase slightly due to increased surveillance activities over No Action. [Text deleted].

Approximately 0.8 m^3 (1 yd^3) of TRU waste from damaged PCVs and contaminated glovebox panels, windows, and gaskets would need to be processed and packaged to meet the WIPP WAC or alternative treatment level. While awaiting shipment to WIPP (depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste), the TRU waste would be stored in above-grade storage facilities. One truck shipment every 11 years or, if applicable, one regular train shipment every 23 years or one dedicated train shipment every 67 years would be required to transport this waste to WIPP.

After treatment and volume reduction, approximately 69 m^3 (90 yd^3) of LLW from solidified liquid LLW (such as decontamination solutions), protective clothing, HEPA filters, glovebox gloves, and decontamination equipment and materials would require disposal. Assuming a land usage of 6,000 m^3/ha (3,200 yd^3/acre), this would require 0.01 ha/yr (0.03 acre/yr) of LLW disposal area at NTS. Assuming 16.6 m^3 (21.7 yd^3) of LLW per shipment, five additional shipments per year from Pantex to NTS would be required.

Contaminated shielding and cleaning materials would be the major contributors to the 0.2 m^3 (50 gals) of liquid and 8 m^3 (10 yd^3) of solid mixed LLW. This small amount of mixed LLW could be treated and disposed of through the use of existing and planned facilities in accordance with the *Pantex Plant Federal Facility Compliance Act Site Treatment Plan/Compliance Plan* (September 1995).

The 1 m^3 (260 gal) of liquid hazardous wastes such as lubricants, cleaning solvents, paint, and lube oil and 1.5 m^3 (2 yd^3) of solid hazardous wastes such as lead packing, wipes, and solid materials contaminated with oils, lubricants, and cleaning solvents would have minimal impact on waste management activities at Pantex, as there is adequate storage capacity while awaiting shipment to a commercial RCRA-permitted treatment and disposal facility.

Approximately 12,900 m^3 (3,400,000 gal) of liquid nonhazardous wastes, including sanitary, utility, and process wastewaters, and cooling system blowdown, would be processed using existing and planned liquid nonhazardous waste facilities. After volume reduction, 138 m^3 (180 yd^3) of solid nonhazardous wastes such as clean non-Pu metals, packing materials, office trash, defective and damaged equipment, and industrial waste from utility and maintenance operations would be shipped to the currently utilized offsite landfill.

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facilities for Continued Plutonium Storage

The Upgrade Without RFETS Pu or LANL Pu Subalternative is similar to the Upgrade With RFETS Pu Pits Subalternative because the modified facilities in Zone 12 South would be designed with adequate capacity to store all of the RFETS Pu pits. No additional resources would be required and therefore the impacts would be the same.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Zone 12 South Facility for Continued Plutonium Storage

The impacts from the inclusion of RFETS and LANL material are bounded by the impacts from the Consolidation Alternative Construct New and Modify Existing Zone 12 South Facilities Option. The amount of

operational waste volumes would be larger than those presented above in the Upgrade Without RFETS or LANL Material Subalternative.

Consolidation Alternative

Construct New and Modify Existing Zone 12 South Facilities

Construction and operation of a consolidated Pu storage facility through an upgrade of existing facilities would have an impact on existing Pantex waste management activities, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Wastes generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations. The types of operational wastes from the consolidated Pu storage facility would be same as those from the Pu Storage Upgrade, but the quantity would change, as shown in Table 4.2.4.10–2.

After treatment and volume reduction of TRU waste, approximately 5 m^3 (7 yd^3) of TRU waste and 4 m^3 (5 yd^3) of mixed TRU waste from leaded gloves and windows, and contaminated Pb shielding would be treated and packaged to meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment to WIPP (depending on decisions resulting from the supplemental EIS noted earlier), the TRU and mixed TRU waste would be stored in above-ground storage facilities. One additional truck shipment per year or, if applicable, one regular train shipment every 2 years or one dedicated train shipment every 6 years would be required to transport these wastes to WIPP or an alternate facility.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW would require disposal at NTS. This would require approximately 0.1 ha/yr (0.3 acre/yr) of LLW disposal area and 38 additional LLW shipments to NTS. The 0.2 m^3 (50 gal) of liquid mixed LLW and 65 m^3 (85 yd^3) of solid mixed LLW would be treated and disposed of through the use of existing and planned facilities according to the Pantex Site Treatment Plan. The 2 m^3 (476 gal) of liquid and 2 m^3 (3 yd^3) of solid hazardous wastes would have a minimal impact on waste management activities at Pantex, as there is adequate storage capacity while awaiting shipment to a commercial RCRA-permitted treatment and disposal facility.

Approximately 109,500 m^3 (28,900,000 gal) of liquid nonhazardous wastes would be processed using existing and planned liquid nonhazardous waste facilities. After volume reduction, 780 m^3 (1,020 yd^3) of solid nonhazardous wastes would require disposal at the offsite landfill.

Construct New Plutonium Storage Facility

Construction and operation of a consolidated Pu new storage facility would have an impact on existing Pantex waste management activities by increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations. The impacts from TRU, low-level, mixed, and hazardous wastes are identical to those identified in the consolidation through upgrade analysis.

The 97,800 m^3 (25,800,000 gal) of liquid nonhazardous wastes would be processed in existing and planned facilities. After volume reduction, 720 m^3 (942 yd^3) of solid nonhazardous wastes would require disposal at the offsite landfill.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction and operation of a consolidated Pu storage facility collocated with HEU storage would have an impact on existing Pantex waste management activities by increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations.

Because there is no TRU or mixed TRU waste associated with HEU storage, the impacts from TRU and mixed TRU wastes are identical to those identified in the consolidated Pu storage alternative. The sources of waste are similar to those of the upgraded Pu storage facility, except the source of radioactive contamination from the HEU storage is uranium. Operational waste volumes are shown in Table 4.2.4.10–2.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW contaminated with Pu and 20 m^3 (26 yd^3) of LLW contaminated with uranium would require disposal at NTS. This would require approximately 0.1 ha/yr (0.3 acre/yr) of LLW disposal area and 39 additional LLW shipments to NTS. The 0.2 m^3 (55 gal) of liquid mixed LLW and 66 m^3 (86 yd^3) of solid mixed LLW would be treated and disposed of through the use of existing and planned facilities according to the *Pantex Site Treatment Plan*. The 2 m^3 (528 gal) of liquid and 2 m^3 (3 yd^3) of solid hazardous wastes would have a minimal impact on waste management activities at Pantex, as there is adequate storage capacity while awaiting shipment to a commercial RCRA-permitted treatment and disposal facility. The 129,500 m^3 (34,200,000 gal) of liquid nonhazardous wastes would be processed in existing and planned facilities. After volume reduction, the 920 m^3 (1,200 yd^3) of solid nonhazardous wastes would require disposal at the offsite landfill.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

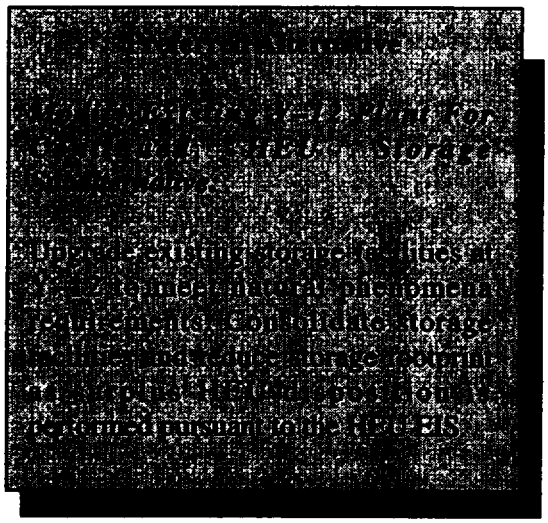
The exclusion of strategic reserve and weapons R&D materials would reduce the amount of operational waste volumes shown in Table 4.2.4.10–2 for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. The decrease would be proportional to the amount of material excluded. [Text deleted.]

Phaseout

The phaseout of Pu storage would have no impact on Pantex waste management activities. The volume of waste would not decrease in any measurable quantity until the facilities in which Pu is stored were D&D.

4.2.5 OAK RIDGE RESERVATION

A listing of the proposed long-term storage alternatives, subalternatives, and related actions, including the No Action Alternative, at ORR is provided below. The potential impacts of implementing these alternatives and related actions at ORR are described in the following sections: 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, and waste management. The specific long-term storage alternatives proposed for ORR are the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative.



Proposed Storage Activities at Oak Ridge Reservation

- **No Action Alternative:** Continue to store ORR nonsurplus HEU material within the scope of this PEIS at Y–12 in stabilized form in accordance with the *Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y–12 Plant, Oak Ridge, Tennessee.*

- **Upgrade Alternative:**

  - ***Modify Existing Y–12 Plant For Continued HEU Storage Subalternative (Preferred Alternative):*** Upgrade existing storage facilities at Y–12 to meet natural phenomena requirements. Consolidate storage facilities and reduce storage footprint as surplus HEU disposition is performed pursuant to the HEU EIS.

    [Text deleted.]

- **Consolidation Alternative:** This storage alternative does not apply to ORR. Siting the consolidated Pu storage facility at ORR would create an HEU collocation condition and is analyzed as part of the Collocation Alternative.

- **Collocation Alternative:** Three options to accommodate all Pu and HEU material within the scope of this PEIS:

  - *Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant:* Construct a new consolidated Pu storage facility east of K–25 and west of ORNL; existing buildings at Y–12 would continue to store ORR nonsurplus HEU material.

Proposed Storage Activities at Oak Ridge Reservation—Continued

- *Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant:* Construct a new consolidated Pu storage facility east of K–25 and west of ORNL and modify existing Y–12 buildings storing ORR nonsurplus HEU material to comply with all ES&H requirements that include improving the capability of facilities to meet design basis seismic events and tornadoes.

- *Construct New Plutonium and Highly Enriched Uranium Storage Facility:* Construct a new collocated Pu and HEU storage facility east of K–25 and west of ORNL.

- **Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials:** Facility and other resource requirements would be smaller than the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative.

- **Phaseout:** ORR nonsurplus HEU material within the scope of this PEIS would be moved out of Y–12 to the collocation site (located at another DOE site).

4.2.5.1 Land Resources

No Action Alternative

Under this alternative, nonsurplus HEU would continue to be stored in stabilized form in accordance with the *Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y–12 Plant, Oak Ridge, Tennessee,* at the current Y–12 Plant interim storage location. The ongoing (no new action) activities conform with present and future land-use plans, policies, and controls. Therefore, no direct or indirect effects to land resources would be anticipated beyond the effects of existing and future activities that are independent of the Proposed Action.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

The ORR nonsurplus HEU inventory requiring storage until final disposition would be stored at Y–12 in existing modified facilities; no new facilities would be built. Therefore, there would be no land disturbance or additional land area required. The majority of this HEU would be housed in facilities currently utilized for HEU storage. The remaining HEU would be stored in facilities that are currently being converted into storage areas. Five existing Y–12 plant facilities would be used for the long-term HEU storage mission.

Land Use. Upgrading the existing HEU storage facility would not change land use. The upgrade would conform with the current *Oak Ridge Reservation Site Development and Facilities Utilization Plan,* which notes that Y–12 is the national storage repository for HEU (OR DOE 1989a:3-5). [Text deleted.] As discussed in Section 4.2.5.8, no in-migration of construction or operation workers is anticipated. Therefore, no indirect effects to offsite land use would occur.

No prime farmlands exist onsite. The upgrade would not be in conflict with city of Oak Ridge land-use plans, policies, and controls since the current *Oak Ridge Area Land Use Plan* designates the potential site for industrial use. Offsite land use would not be affected.

Visual Resources. Because this alternative proposes to modify existing facilities, potential impacts to visual resources would not be caused by the upgrade. The current VRM Class 5 designation of Y–12 would remain.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

This option assumes the use of existing storage, No Action for HEU (continued storage of ORR nonsurplus HEU material at Y–12 until final disposition), and construction of a new Pu storage facility east of K–25 and west of ORNL near the intersection of Route 95 and Bear Creek Road, to accommodate all Pu within the scope of this PEIS. Although No Action for HEU would not disturb land or require additional land area, construction of the new consolidated Pu facility would disturb 58.5 ha (144 acres) of land area during construction of which 56 ha (138 acres) of land area would be used during operations. The facility would be sited in a buffer zone less than 1.6 km (1 mi) from the site boundary.

Land Use. Construction and operation of the consolidated Pu storage facility would change the existing forested/undeveloped land use of the potential facility site located near the intersection of Route 95 and Bear Creek Road. A portion of the consolidated proposed facility location is situated in the NERP. The future land-use plan of the current *Oak Ridge Reservation Site Development and Facilities Utilization Plan* designates a portion of the potential site as a Waste Management Area (OR DOE 1991f:5-3). Therefore, potential direct land-use impacts could occur for the Pu consolidation facilities. No direct effects to land use or visual resources are anticipated with No Action for HEU. As discussed in Section 4.2.5.8, expected vacancies and historic housing construction rates indicate that there would be sufficient housing available to accommodate in-migrant construction and operational workers and their families. Therefore, no indirect impacts to offsite land use would occur.

The option would affect the use of the NERP, but other ORR land uses would not be affected. No prime farmlands exist onsite. The option would not be in conflict with the city of Oak Ridge land-use plans, policies, and controls since the current *Oak Ridge Area Land Use Plan* designates the potential site for Industrial and/or Public land use depending on the exact location chosen.

Visual Resources. [Text deleted.] Construction and operation of the consolidation facility would change the current VRM Class 4 designation of the Bear Creek Road/Route 95 site to Class 5, which would cause potential visual impacts to Bear Creek Road and Route 95, public roadways with high sensitivity levels. Construction and operation activities and facility development on the environmentally sensitive (wooded and steep slopes) site would be highly visible from these roadways and would alter the existing landscape character.

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

This option includes the construction of a new Pu storage facility at ORR east of K–25 and west of ORNL near the intersection of Route 95 and Bear Creek Road and modification of the existing HEU storage facility at Y–12. The option would disturb 58.5 ha (144 acres) of land area during construction of which 56 ha (138 acres) would be used during operations. The facility would be sited in a buffer zone less than 1.6 km (1 mi) from the site boundary.

Land Use. Land-use effects at the Bear Creek Road/Route 95 site would be similar to the Collocation Alternative new Pu storage facility. Upgrading the existing HEU storage facilities at Y–12 would not change land use; the upgrade would conform with the current *Oak Ridge Reservation Site Development and Facilities Utilization Plan* (OR DOE 1989a:3-5). As discussed in Section 4.2.5.8, expected vacancies and historic construction rates indicate that there would be sufficient housing available to accommodate in-migrant construction and operational workers and their families. Therefore, no indirect effects to offsite land use would occur as a result of the option.

Impacts to other ORR land uses, special status lands, and potential conflicts with the city of Oak Ridge land-use plans, policies, and controls would be similar to the Collocation Alternative new Pu storage facility.

Visual Resources. Visual resources effects at the Bear Creek Road/Route 95 site would be similar to the Collocation Alternative new Pu storage facility. However, the magnitude and extent of potential visual effects could be greater due to the larger area of land disturbed. Potential effects of the Y–12 upgrade on the sensitive viewpoints and special status lands would not occur; the existing VRM Class 5 designation of the Y–12 Plant would remain.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Under this option, all HEU within the scope of this PEIS would be stored at a primary new storage plant, collocated with the Pu storage plant at ORR on undisturbed land east of K–25 and west of ORNL near the

intersection of Route 95 and Bear Creek Road. Pu and HEU storage in existing DOE storage facilities would be phased out. The collocated storage plant would require a total of 23 buildings, the majority of which would be one level. No structure would exceed three levels. Land disturbance would be 89.5 ha (221 acres) during construction of which 87 ha (215 acres) would be used during operation. A buffer zone less than 1.6 km (1 mi) would be provided between facilities and the ORR site boundary. Although more land area would be disturbed, impacts to land resources would be similar to the Collocation Alternative new Pu storage facility.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, land effects during construction and operation would be almost the same in extent and magnitude to the No Action Alternative, Upgrade Alternative, and Collocation Alternative because the facility would be almost the same. However, because the smaller quantity of material would require smaller facilities, it is likely that less land area would be disturbed during construction and used during operations. [Text deleted.]

Phaseout

Phaseout of the current HEU storage mission would not require additional land area or new construction. ORR nonsurplus HEU material would be moved out of Y–12 to the collocation site. Potential impacts to visual resources could occur if facilities are not maintained.

[Text deleted.]

4.2.5.2 Site Infrastructure

The ORR site is capable of supporting all of its proposed storage alternatives without major infrastructure modification. Table 4.2.5.2–1 presents a comparison of the annual operating infrastructure resource requirements relative to the availability or capacity for the onsite transportation network, electrical power, and fuel supply.

No Action Alternative

Under this alternative, storage of HEU materials would continue at the Y–12 facility. ORR does not currently store Pu-bearing materials in the form or quantity that would be within the scope of this PEIS, and under No Action no Pu would be shipped to ORR. [Text deleted.] All infrastructure requirements are within site capacities.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

Construction of the Y–12 upgrade to accommodate long-term storage of existing quantities of HEU at ORR would not affect the site infrastructure. Data for construction are presented in Appendix C. Some additional coal would be needed. Since coal availability is governed by usage and not by storage capacity, the additional coal required could be procured through normal contractual means. Site infrastructure requirements for operations are within existing site capacities. As a result, there would be minimal impacts on the site infrastructure.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

This option assumes that No Action for HEU storage is taken at Y–12, but that storage for Pu is provided. Construction of the consolidated Pu storage facility at ORR would not affect the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to the ORR infrastructure under this option would be minimal.

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Construction of a new consolidated Pu storage facility to provide long-term storage of Pu at ORR and modifying Y–12 for long-term HEU storage would not affect the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to the ORR infrastructure under this option would be minimal. As shown in Table 4.2.5.2–1, less than 5 km (3 mi) of roads and less than 10 km (6 mi) of railroad lines would need to be added to the site to accommodate the facility. Also, some additional coal and oil would be needed. Since coal and oil availability is governed by usage and not by storage capacity, the additional coal and oil required could be procured through normal contractual means. All other infrastructure requirements are within site capacities.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction of a new consolidated Pu and HEU storage facility at ORR would consume approximately 25 percent more materials and resources than building the consolidated Pu storage facility and modifying the existing Y–12 HEU storage facility. However, the impact of constructing these facilities is not expected to result

Table 4.2.5.2–1. Site Infrastructure Changes Required for Operation at Oak Ridge Reservation (Annual)—No Action (2005) and Storage Alternatives

Alternative	Transportation		Electrical		Fuel		
	Roads (km)	Railroad (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
No Action							
Site Availability	71	27	13,880,000	2,100	416,000	250,760,000	16,300
Projected usage	71	27	726,000	110	379,000	95,000,000	16,300
Upgrade							
Projected usage	71	27	733,260	111	379,000	95,000,949	16,460
Amount required in excess to site availability	0	0	0	0	0	0	160
Collocation							
New Pu Storage Facility Only							
Projected usage	76	37	779,000	119	427,000	95,000,000	21,800
Amount required in excess to site availability	<5	<10	0	0	11,000	0	5,500
New Pu Storage Facility and Modify Y–12							
Projected usage	76	37	786,260	120	427,000	95,000,949	21,963
Amount required in excess to site availability	<5	<10	0	0	11,000	0	5,663
New Pu and HEU Storage Facilities							
Projected usage	78	37	779,480	119	429,000	94,998,103	22,273
Amount required in excess to site availability	<7	<10	0	0	13,000	0	5,973
Phaseout							
Projected usage	71	27	711,480	108	379,000	94,998,103	15,973
Amount required in excess to site availability	0	0	0	0	0	0	0

Source: DOE 1996e; DOE 1996f; OR LMES 1995e; ORR 1995a:2.

in any significant effects at ORR. Operations impacts to the ORR infrastructure under this option would be minimal. As shown in Table 4.2.5.2–1, less than 7 km (4 mi) of roads and less than 10 km (6 mi) of railroad lines would need to be added to the site to accommodate these facilities. Additional coal and oil required for operations would be procured as stated above for the consolidated Pu storage facility.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Since the existing ORR site infrastructure would be capable of supporting construction/modification and operation of facilities for the No Action Alternative, the Upgrade Alternative, and the Collocation Alternatives, constructing and operating such facilities without including provisions for storage of strategic reserve and weapons R&D materials could be accommodated as well. Expected reductions in amounts of annual electrical requirements for the various storage facilities are the only site infrastructure changes expected if this subalternative is chosen because electric usage is dependent on the amount of material. [Text deleted.]

Phaseout

Phaseout of the HEU storage mission at Y–12 would have little or no impact on the facilities or site infrastructure. Facilities would need to be decontaminated and decommissioned prior to reuse or dismantlement, and any D&D, if proposed, would be accompanied by further NEPA analysis. The decrease in the annual consumption of utility resources is a small fraction (about 2 percent) of the existing annual usage.

4.2.5.3 Air Quality and Noise

Construction and operation activities associated with the No Action Alternative and the proposed storage alternatives would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts at ORR, criteria and toxic/hazardous concentrations from the No Action Alternative and the proposed storage alternatives are compared with Federal and State standards and guidelines. Impacts from radiological airborne emissions are described in Section 4.2.5.9.

In general, all of the proposed storage facilities would emit the same types of air pollutants during construction. It is expected emissions would not exceed Federal, State, or local air quality regulations. PM_{10} and TSP concentrations will be increased, especially during peak construction periods.

The principal sources of emissions during construction include the following:

- Fugitive dust from land clearing, site preparation, excavation, and wind erosion of exposed ground surfaces
- Exhaust and road dust generated by construction equipment, vehicles delivering construction materials, and vehicles carrying construction workers

During operation, concentrations of criteria and toxic/hazardous air pollutants emitted by the individual storage facilities are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Table 4.2.5.3–1 presents the estimated pollutant concentrations for each of the storage alternatives, indicating little difference between alternatives with respect to impacts to air quality.

Emission rates attributed to operation of the proposed storage facilities are presented in Tables F.1.3–1 and F.1.3–3. [Text deleted.] Air pollutant emission sources associated with operations include the following:

- Operation of existing boilers for space heating
- Operation of diesel generators and periodic testing of emergency diesel generators
- Exhaust and road dust generated by vehicles delivering supplies and bringing employees to work
- Toxic/hazardous pollutant emissions from facility processes

Noise impacts during either construction or operation are expected to be low. Air quality and noise impacts for each storage alternative are described separately. Supporting data for the air quality and noise analyses are presented in Appendix F.

AIR QUALITY

An analysis was conducted of the potential air quality impacts of emissions from each of the storage alternatives as described in Section 4.1.3. Section 176 (c) of the 1990 CAA Amendments requires that all Federal actions conform with the applicable SIP. The EPA has implemented rules that establish the criteria and procedures governing the determination of conformity for all Federal actions in nonattainment and maintenance areas. These are discussed in Section 4.1.3. The attainment status of the area in which ORR is located is discussed in Section 3.6.3. Since the area is considered an attainment area for criteria pollutants, the proposed actions at this site do not require that a conformity analysis be performed.

Table 4.2.5.3–1. Estimated Operational Concentrations of Pollutants at Oak Ridge Reservation and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Collocation		
					New Pu Storage Facility Only ($\mu g/m^3$)	New Pu Storage Facility and Modify Y–12 ($\mu g/m^3$)	New Pu and HEU Storage Facilities ($\mu g/m^3$)
Criteria Pollutants							
Carbon monoxide	8-hour	10,000[b]	5	5	5.08	5.07	5.09
	1-hour	40,000[b]	11	11	11.16	11.15	11.18
Lead	Calendar Quarter	1.5[b]	0.05	0.05	0.05	0.05	0.05
Nitrogen dioxide	Annual	100[b]	3	3	3	3.06	3.07
Ozone	1-hour	235[b]	[c]	[c]	[c]	[c]	[c]
Particulate matter less than or equal to 10 microns in diameter	Annual	50[b]	1	1	1	1	1.01
	24-hour	150[b]	2	2	2.05	2.05	2.05
Sulfur dioxide	Annual	80[b]	2	2	2.10	2.10	2.12
	24-hour	365[b]	32	32	33.07	33.03	33.25
	3-hour	1,300[b]	80	80	84.17	84.03	84.87
Mandated by Tennessee							
Total suspended particulates	24-hour	150[d]	2	2	2.05	2.04	2.05
Gaseous fluorides (as HF)	30-day	1.2[d]	0.2	0.2	0.2	0.2	0.2
	7-day	1.6[d]	0.3	0.3	0.3	0.3	0.3
	24-hour	2.9[d]	0.6[e]	0.6[e]	0.6[e]	0.6[e]	0.6[e]
	12-hour	3.7[d]	0.6[e]	0.6[e]	0.6[e]	0.6[e]	0.6[e]
	8-hour	250[d]	0.6	0.6	0.6	0.6	0.6

Table 4.2.5.3–1. Estimated Operational Concentrations of Pollutants at Oak Ridge Reservation and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Collocation		
					New Pu Storage Facility Only ($\mu g/m^3$)	New Pu Storage Facility and Modify Y–12 ($\mu g/m^3$)	New Pu and HEU Storage Facilities ($\mu g/m^3$)
Hazardous and Other Toxic Compounds							
1,1,1-Trichloroethane	8-hour	191,000[d]	1.9	1.9	1.9	1.9	1.9
Acetic acid	8-hour	2,500[d]	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine	8-hour	150[d]	4.1	4.1	4.1	4.1	4.1
Hydrogen chloride	8-hour	750[d]	57	57	57	57	57
Hydrazine	8-hour	1.3[d]	[f]	[f]	[f]	[f]	<0.01[g]
Mercury	8-hour	5[d]	0.06[h]	0.06[h]	0.06[h]	0.06[h]	0.06[h]
Methyl alcohol	8-hour	26,200[d]	219.3	219.3	219.3	219.3	219.3
Nitric acid	8-hour	[i]	78	78	78	78	78
Phosphoric acid	8-hour	[i]	[f]	[f]	[f]	[f]	<0.01[g]
Sulfuric acid	8-hour	100[d]	20	20	20	20	20

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.

[b] Federal and State standard.

[c] Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate site. See Section 4.1.3 for a discussion of ozone-related issues.

[d] State standard or guideline.

[e] 8-hour concentration was used.

[f] No sources of this pollutant have been identified.

[g] The concentration represents the alternative contribution only.

[h] Annual average (monitored value).

[i] No State standard for indicated averaging time.

Note: Concentrations are based on site contribution, including concentrations from ongoing activities (No Action), and do not include the contribution from non-facility sources (for example, traffic).

Source: 40 CFR 50; DOE 1996e; DOE 1996f; OR DOE 1993a; OR LMES 1996i; OR MMES 1996a; TN DEC 1994a; TN DHE 1991a.

No Action Alternative

This alternative utilizes estimated air emissions data from operations at ORR assuming continuation of site missions as described in Section 3.6. These data reflect conservative estimates of criteria and toxic/hazardous emissions at ORR. The emission rates for the criteria and toxic/hazardous pollutants for No Action for the total site are presented in Table F.1.2.6–1. Table 4.2.5.3–1 presents the No Action concentrations. During dry and windy conditions 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 all other criteria and toxic/hazardous air pollutants at the site boundary or public-access highways are expected to remain within applicable Federal, State, and local ambient air quality standards.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

It is expected that concentrations of pollutants at the site boundary or public access highways would remain within applicable Federal and State ambient air quality standards during upgrade of facilities for continued HEU storage.

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.5.3–1.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

In addition to the types of sources of emissions during construction associated with the No Action and the Upgrade Alternative, fugitive dust resulting from the operation of a concrete batch plant would be an additional emission source associated with this storage alternative.

Increased PM_{10} and TSP concentrations may occur during the peak construction period, particularly during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. Concentrations of all pollutants at the site boundary or public-access highways would remain within applicable Federal and State ambient air quality standards during construction.

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.5.3–1.

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Air quality impacts for construction for this option are expected to be similar to those discussed previously for the new Pu storage facility only option.

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.5.3–1.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Air quality impacts for construction for this option are expected to be similar to those discussed previously for the new Pu storage facility only option.

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.5.3–1.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Air quality impacts for construction and operation for this subalternative are expected to be similar to those described previously for the No Action Alternative, the Upgrade Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

Phaseout of existing HEU inventories as a result of consolidating HEU at another site is expected to result in a small reduction in air pollutant concentrations from the No Action concentrations and would be in compliance with Federal and State standards.

NOISE

The location of the storage facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts.

Noise sources during construction may include heavy construction equipment and increased traffic. Increased traffic would occur onsite and along offsite local and regional transportation routes used to bring construction material and workers to the site.

No Action Alternative

Nontraffic noise sources associated with continued interim storage and other ongoing missions are the same as described in Chapter 3. The continuation of operations at ORR would result in no appreciable change in traffic noise and onsite operational noise sources from current levels. Nontraffic noise sources are located at sufficient distance from offsite areas that the contribution to offsite noise levels would continue to be small. Due to the size of the site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts, such as disturbance of wildlife.

Upgrade (Preferred Alternative) and Collocation Alternatives

Nontraffic noise sources associated with the storage alternatives would be similar to those for existing facilities as discussed in Chapter 3. Nontraffic, operational noise sources associated with the storage alternatives include existing or additional equipment and machines (cooling systems, vents, motors, and material handling equipment). These noise sources would be located at sufficient distance from offsite areas that the contribution

to offsite noise levels would be small. Due to the size of the site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts, such as disturbance of wildlife.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Noise impacts for construction and operations for this option are expected to be almost the same as those previously described for the No Action Alternative, the Upgrade Alternative, and the Collocation Alternative because noise impacts are based on the use of the facility and not the size.

Phaseout

A reduction in noise levels associated with facility operations may result from the phaseout of storage facilities.

4.2.5.4 Water Resources

Impacts associated with the long-term storage options at ORR would affect water resources. The proposed upgrade storage facilities are located outside any 100-year and 500-year floodplain boundaries. No 100- or 500-year floodplain assessments have been conducted at the area proposed for the Collocation Alternative. This could be developed during the siting process. At ORR, surface water resources, primarily the Clinch River, would be used to meet all construction and operation water requirements. The Clinch River has sufficient flow to support any of the alternatives. No construction- or operation-related water withdrawal would exceed 1 percent of the Clinch River's average flow. During construction and operation of the facilities, treated wastewater would be discharged in compliance with permit requirements to nearby streams. Stormwater runoff would be collected, and treated, if necessary, before discharge to natural drainage channels in accordance with permit requirements. [Text deleted.]

Minimal impacts to groundwater are anticipated because no groundwater would be withdrawn and no direct discharges would occur during construction or operation. Table 4.2.5.4–1 presents No Action water resources uses and discharges and the potential changes to water resources at ORR resulting from the long-term storage alternatives.

No Action Alternative

Surface Water. [Text deleted.] A description of the activities that would continue at ORR is provided in Section 3.6. Under this alternative, because of increased operating requirements of existing facilities at ORR, surface water withdrawals from the Clinch River are expected to increase from the current usage of 14,210 million l/yr (3,750 million gal/yr) to 14,760 million l/yr (3,900 million gal/yr), or 0.35 percent of the river's average flow (132 m^3/s [4,647 ft^3/s]) by the year 2005. Wastewater discharges from Y–12 would continue to East Fork Poplar Creek and Bear Creek, although the volume is expected to increase. As discussed in Section 3.6.4, DOE is currently involved with remediation of East Fork Creek under CERCLA. Under this alternative, current restoration programs would continue.

Groundwater. Under this alternative, no additional impacts to groundwater resources are anticipated beyond those of existing and future activities, which are independent of and unaffected by the proposed action. Currently, one well supplies a small amount of water for a laboratory. Groundwater use is expected to remain constant in 2005.

Water quality data obtained from wells located near the Y–12 facility indicate that water quality has improved near site operations. Under this alternative, current restoration programs would continue. Process and wastewater would continue to be treated at either the Y–12 centralized pollution control facility or at the Y–12 west end treatment facility before being discharged to surface waters. Minimal impacts on groundwater quality are expected due to wastewater releases.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

Surface Water. Water required for construction and operation of the upgraded HEU storage facilities would be provided via existing distribution systems. The source of this water is the Clinch River and its tributaries. [Text deleted.]

Table 4.2.5.4–1. No Action and Potential Changes to Water Resources at Oak Ridge Reservation—No Action (2005) and Storage Alternatives

Affected Resource Indicator	No Action	Upgrade	Collocation			Phaseout
			New Pu Storage Facility Only	New Pu Storage Facility and Modify Y–12	New Pu and HEU Storage Facilities	
Water Source	Surface	Surface	Surface	Surface	Surface	Surface
Construction						
Water Availability and Use						
Total water requirement (million l/yr)	NA[a]	3.0	85	88	104.7	0.0
Percent increase in projected water use[b]	NA[a]	0.02	0.6	0.6	0.7	0.0
Percent of streamflow[c]	NA[a]	0.00007	0.002	0.002	0.003	0.0
Water Quality						
Wastewater discharge (million l/yr)	NA[a]	3.0	7.8	10.8	13.0	0.0
Percent change in wastewater discharge[d]	NA[a]	0.1	0.3	0.5	0.6	0.0
Percent change in streamflow[e]	NA[a]	0.006	0.02	0.02	0.03	0.0
Operation						
Water Availability and Use						
Total water requirement (million l/yr)	14,760	0.24	280	280.2	360	-0.29
Percent increase in projected water use[f]	0.0	0.002	1.9	1.9	2.4	0.00
Percent of streamflow[c]	0.35	0.000005	0.007	0.007	0.009	0.000006

Table 4.2.5.4–1. No Action and Potential Changes to Water Resources at Oak Ridge Reservation—No Action (2005) and Storage Alternatives—Continued

Affected Resource Indicator	No Action	Upgrade	Collocation			Phaseout
			New Pu Storage Facility Only	New Pu Storage Facility and Modify Y–12	New Pu and HEU Storage Facilities	
Water Quality						
Total wastewater discharge (million l/yr)	2,277	0.001	137	137	172	0.0
Percent change in wastewater discharge[g]	0.0	0.00009	6.0	6.0	7.6	0.0
Percent change in streamflow[c]	NA	0.0	0.3	0.3	0.4	0.0
Floodplain						
Is action in 100-year floodplain?	NA	No	Uncertain	Uncertain	Uncertain	No
Is critical action in 500-year floodplain?	NA	No	Uncertain	Uncertain	Uncertain	NA

[a] See operations section of table for No Action water data.

[b] Percent increases in projected water use during construction at ORR are calculated by dividing No Action water requirements (14,760 million l/yr) with that for each storage option: HEU storage upgrade (3 million l/yr), new consolidated Pu storage facility only (85 million l/yr), new consolidated Pu storage facility and upgrade Y–12 facility (88 million l/yr), new consolidated Pu and HEU storage facility (104.7 million l/yr), and HEU storage phaseout (0 million l/yr).

[c] Percent of streamflow is calculated from the average flow of the Clinch River (132 m^3/s).

[d] Percent changes in wastewater discharged during construction at ORR are calculated by dividing No Action wastewater discharges (2,277 million l/yr) with that for each storage option: HEU storage upgrade (3.0 million l/yr), new consolidated Pu storage facility only (7.8 million l/yr), new consolidated Pu storage facility and upgrade Y–12 Plant (10.8 million l/yr), new consolidated Pu and HEU storage facility (13.0 million l/yr), and HEU storage phaseout (0 l/yr).

[e] Percent changes in stream flow from wastewater discharges are calculated from the average flow of the Clinch River (132 m^3/s) and East Fork Poplar Creek (1.5 m^3/s). The comparison for East Fork Poplar Creek is shown in the table.

[f] Percent increases in projected water use during operation at ORR are calculated by dividing No Action water requirements (14,760 million l/yr) with that for each storage option: HEU storage upgrade (0.24 million l/yr), new consolidated Pu storage facility only (280 million l/yr), new consolidated Pu storage facility and upgrade Y–12 Plant (280.2 million l/yr), new consolidated Pu and HEU storage facility (360 million l/yr), and HEU storage phaseout (0.29 million l/yr).

[g] Percent changes in wastewater discharged during operation at ORR are calculated by dividing No Action water discharges (2,277 million l/yr) with that for each storage option: HEU storage upgrade (0.001 million l/yr), new consolidated Pu facility storage (137 million l/yr), new consolidated Pu storage facility and upgrade Y–12 plant (137 million l/yr), new consolidated Pu and HEU storage facility (172 million l/yr), and HEU storage phaseout (0 l/yr).

Note: Construction impacts are considered to be temporary, lasting only throughout the construction period. Impacts from operations would occur continuously. NA=not applicable.

Source: DOE 1996e; DOE 1996f; OR LMES 1995e; OR MMES 1996a.

During construction, the quantity of water required would be approximately 3.0 million l/yr (0.79 million gal/yr), which would represent a much less than 1-percent increase over the projected No Action surface water withdrawal. This additional withdrawal would cause minimal impacts. During operation, water requirements would be approximately 0.24 million l/yr (0.063 million gal/yr). Supplying this quantity of water would have minimal impacts.

During construction of the upgraded HEU storage facilities, sanitary wastewater (approximately 3.0 million l/yr [0.8 million gal/yr]) would be generated and discharged to the existing Oak Ridge wastewater treatment facility. This would represent a much less than 1-percent increase in the effluent from this facility. During operation, additional sanitary wastewater (0.001 million l/yr [264 gal/yr]) would be discharged to this wastewater treatment system. This would represent a negligible increase in the effluent from this facility. Stormwater runoff would be collected and treated, if necessary, before discharge to natural drainage channels. These additional quantities are insignificant. All discharges would be monitored to comply with permit limits and other discharge requirements.

As discussed in Section 3.6.4, DOE is currently involved with remediation of East Fork Poplar Creek under CERCLA. Any discharges that may influence and potentially impact East Fork Poplar Creek would require engineering design measures to avoid interference with the goals of the remediation effort. All potential HEU storage locations are outside both the 100- and 500-year floodplains.

Groundwater. No groundwater would be used for any project-related water requirements, and no wastewater would be discharged directly to groundwater. Therefore, neither groundwater quality nor availability would be affected. In addition, because there would be no direct discharges to the environment, limestone deposits located beneath the plant would not be a factor for future contamination.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Surface Water. During construction of the facilities, approximately 85 million l/yr (22.5 million gal/yr) would be supplied from the Clinch River. This amount equates to approximately a 0.6-percent increase in annual water use and much less than 1 percent of the Clinch River flow. During operation, water requirements would be 280 million l/yr (74 million gal/yr), representing a 1.9-percent increase in projected water use and much less than 1 percent of the Clinch River flow. Supplying this amount would cause minimal impacts.

During construction, approximately 7.8 million l/yr (2.1 million gal/yr) of sanitary wastewater would be generated, treated, and discharged to the existing Oak Ridge wastewater treatment facility. This would represent a 0.3-percent increase in the effluent from this facility. During operation, additional sanitary wastewater (137 million l/yr [36.2 million gal/yr]) would be discharged to this wastewater treatment system. All discharges would be monitored to comply with discharge requirements.

No 100- or 500-year floodplain assessments have been conducted for the new collocated facilities. This would be developed during the siting process.

Groundwater. No groundwater would be used for any project-related water requirements and no wastewater would be discharged directly to groundwater. Therefore, neither groundwater quality nor availability would be affected. In addition, because there would be no direct discharges to groundwater, limestone deposits located beneath the plant would not be a factor for future groundwater contamination transportation.

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Surface Water. The water requirements during construction and operation of the new consolidated Pu storage facility and upgraded Y–12 are slightly higher than those discussed for the Pu storage facility only. The water requirements are approximately 88 million l/yr (23.2 million gal/yr) during construction and 280.2 million l/yr (74 million gal/yr) during operation, which would represent about a 0.6- and 1.9-percent increase, respectively, over the projected No Action surface water withdrawal. These amounts each represent much less than 1 percent of the Clinch River flow and would cause minimal impacts to river levels.

During construction of the facilities, sanitary wastewater (10.8 million l/yr [2.3 million gal/yr]) would be generated and discharged to the treatment facility. During operations, additional sanitary wastewater (137 million l/yr [36.2 million gal/yr]) would be treated, and the effluent discharged. All discharges would be routinely monitored to comply with NPDES permit limits and other site-specific discharge requirements. All potential locations are located outside both the 100- and 500-year floodplains.

No 100- or 500-year floodplain assessments have been conducted for the new collocated facilities. This would be developed during the siting process.

Groundwater. No groundwater would be used for any project-related water requirements, and no wastewater would be discharged directly to groundwater. Therefore, neither groundwater quality nor availability would be affected. In addition, because there would be no direct discharges to the environment, limestone deposits located beneath the plant would not be a factor for future groundwater contamination.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

[Text deleted.]

The impacts associated with the new Pu and HEU storage facilities are the same as those discussed above, with the following exceptions. The water requirements for construction and operation of this option are greater than those described for the new consolidated Pu storage facility and upgrade of Y–12 Plant and are approximately 104.7 million l/yr (27.7 million gal/yr) and 360 million l/yr (95.1 million gal/yr), respectively. These additional requirements represent 0.7- and 2.4-percent increases, respectively, in the projected annual surface water withdrawals from the Clinch River. These increases, however, represent much less than 1 percent of the average flow of the Clinch River and would cause minimal impacts.

Sanitary wastewater quantities generated during construction and operation of this option are approximately 13.0 million l/yr (3.4 million gal/yr) and 172 million l/yr (45.4 million gal/yr), respectively. These additional effluents represent 0.6- and 7.6-percent increases, respectively, in discharge and 0.03- and 0.4-percent, respectively, of the average flow of East Fork Poplar Creek. No impacts are expected.

As discussed in Section 3.6.4, DOE is currently involved with remediation of East Fork Poplar Creek under CERCLA. Any discharges that may influence and potentially impact East Fork Poplar Creek would require engineering design measures to avoid interference with the goals of the remediation effort. Since groundwater would not be used for this option, no impacts to groundwater availability or quality would be expected.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Water resource impacts during construction and operation for this subalternative are expected to be slightly less than those for the No Action Alternative, the Upgrade Alternative, and the Collocation Alternative because of the reduction in the amount of material. [Text deleted.]

Phaseout

If the current HEU storage mission at ORR was phased out, surface water withdrawals from the Clinch River and nonhazardous wastewater discharge to the Clinch River would decrease by negligible quantities (0.29 million l/yr [0.077 million gal/yr]). No noticeable impacts would occur or be alleviated due to these decreases.

[Text deleted.]

4.2.5.5 Geology and Soils

Construction and operation of the alternatives at ORR would have no impact on the geological resources identified. A low seismic risk exists, but would be considered in the design of the proposed alternatives. The existing seismic risk does not preclude the safe construction and operation of the proposed alternative facilities. The facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1, *Facility Safety.* Because there are no known capable faults at ORR, ground rupture as a result of an earthquake during the life of the facility is minimal; ground shaking is more likely to occur. Intensities of more than VI on the MMI scale are not likely at ORR. Ground shaking could affect the integrity of inadequately designed (older) or nonreinforced structures but would not affect newly designed or modified facilities. Human health effects from accidents initiated by natural phenomena (for example, earthquakes) are discussed in Section 4.2.5.9. Volcanic activity is improbable during the life of an alternative and is not anticipated to affect the construction and operation of the alternatives. It is also unlikely that landslides or other nontectonic events would affect the proposed alternatives. Slopes and underlying foundation materials are generally stable. Sinkholes are present in the Knox Dolomite, however the Knox Dolomite is not present in Bear Creek Valley or proposed alternative areas. Properties and conditions of soils underlying ORR typically have no limitations on construction. No economically viable geological resources are known to be present at ORR.

Impacts to the geological and soil resources occur during, or as a result of, ground-disturbing construction activities. Construction of the alternatives may involve ground-disturbing activities that could affect the soil resources. The amount of land disturbed is specified below for each alternative. Effects to the soil resource would depend on the specific soil units in the disturbed area, the extent of land-disturbing activities, and the amount of soil disturbed. Within ORR, the soil erosion potential is directly related to the amount of land disturbed because soil and climatic conditions are similar throughout the site. Control measures would be employed to minimize soil erosion.

No Action Alternative

[Text deleted.] Under the No Action Alternative, DOE would continue current and ongoing activities at ORR. There would be no ground-disturbing activities beyond those associated with existing and future site improvements. Because no new construction and the associated ground disturbance for potential soil erosion would occur, the No Action Alternative would have no effect on geologic or soil resources at the site.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

Because no new ground-breaking construction activities are planned under this alternative, no construction or operational effects to geologic or soil resources are anticipated.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Construction of the new Pu storage facility will occur on undisturbed land, as described in Section 4.2.5.1. During construction approximately 58.5 ha (144 acres) would be disturbed. Soil disturbance would occur primarily from ground-disturbing construction activities (foundation preparation) and activities associated with building construction laydown areas that can expose the soil profile and lead to a possible increase in erosion as a result of wind and water action. Soil losses would depend on the frequency and severity of storms; wind velocities (increased wind velocities and duration can increase soil erosion potential); and the size, location, and duration of ground-disturbing activities with respect to local drainage and wind patterns.

Net soil disturbance during operations would be considerably less than during construction because areas temporarily used for construction laydown would be restored. Although stormwater runoff and wind action could occur occasionally during operations, they are anticipated to be minimal. [Text deleted.]

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

No apparent direct or indirect effects on the geologic resources are anticipated, because neither facility construction and operational activities nor site infrastructure improvements will restrict access to potential geologic resources.

Construction and operation effects on geology and soil resources for this option would be similar to those described for the new Pu storage facility and maintain existing HEU storage option. [Text deleted.] Construction of the new Pu storage facility for this subalternative would occur on undeveloped land, as described in Section 4.2.5.1. Approximately 58.5 ha (144 acres) would be disturbed for the new facilities, affecting the soil profile and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil impacts during operation are expected to be minimal.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

No apparent direct or indirect effects on the geologic resources are anticipated, because neither facility construction and operational activities nor site infrastructure improvements will restrict access to potential geologic resources.

Construction and operation effects on geology and soil resources for this option would be similar to those described for the new Pu storage facility and maintain existing HEU storage option. Construction of these facilities would occur completely on undisturbed land, as described in Section 4.2.5.1. Additional soil impacts would be anticipated because this option has the greatest construction and operations land use. Approximately 89.5 ha (221 acres) would be disturbed for construction of the new facilities, affecting the soil profile and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil impacts during operation are expected to be minimal.

Subalternatives Not Including Strategic Reserve and Weapons Research and Development Materials

Excluding strategic reserve and weapons R&D materials would give almost the same effects to the geologic and soil resources for the No Action Alternative, the Upgrade Alternative, and the Collocation Alternative. By excluding these materials, the size of a facility would be similar, thus not changing the amount of land disturbed by construction activities. No effect to the geological resource is anticipated as a result of this subalternative.

Phaseout

The phaseout of storage capacity would have no apparent effects on the geology resources. However, phaseout could result in beneficial effects in the soil of the area. Hazardous, radioactive, and mixed waste sources would be eliminated from the area, thus decreasing the potential for future soil contamination.

[Text deleted.]

4.2.5.6 Biological Resources

No Action Alternative

Under No Action, the HEU storage mission described in Section 2.2.5 would continue at ORR. These activities would result in no appreciable change to current conditions of biological resources at ORR as described in Section 3.6.6.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

Upgrading existing HEU storage facilities at Y–12 would cause minimal disturbance to biological resources. This is the case since upgrades would involve existing structures and would take place within an area that is currently disturbed by existing facilities and operations. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to Y–12 have already adapted to its presence. Water withdrawal and wastewater discharge would be through existing structures and would involve relatively minor volumes, so wetlands and aquatic resources would not be affected. Discharges would not be expected to be large enough to affect resident populations of the Tennessee dace (deemed in need of management by the State) in Bear Creek.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Under this alternative, consolidated Pu materials would be stored in a new storage facility at ORR. Impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species are described below.

Terrestrial Resources. Construction and operation for the consolidated Pu storage facility at ORR would result in the disturbance of 58.5 ha (144 acres) or about 0.4 percent of ORR. This acreage includes areas on which the facility would be constructed, as well as areas that would be revegetated following construction. Vegetation within the area to be developed would be destroyed during land clearing. Vegetation cover within the proposed site is predominantly oak-hickory forest or pine and pine-hardwood forest (Figure 3.6.6–1). While both types would be affected by construction, it is likely that a greater area of pine and pine-hardwood forests would be removed. This type of forest is more heavily concentrated in valleys, which is where most of the development would occur. Oak-hickory forests are typically found on ridges. Both forest types are common throughout ORR and within the region.

Construction of the proposed facilities would effect some animal populations. Less-mobile animals within the proposed project area, such as amphibians, reptiles, and small mammals, would not be expected to survive. Construction activities and noise would cause larger mammals and birds in the construction area and adjacent areas to move to similar habitat nearby. If the area to which they moved was below its carrying capacity, these animals would be expected to survive. However, if the area was already supporting the maximum number of individuals, the additional animals would compete for limited resources, which could lead to habitat degradation and eventual loss of the excess population. Nests and young animals living within the proposed site may not survive. The site would be surveyed as necessary for the nests of migrating birds prior to construction. Upon completion of construction, revegetated areas would be of minimal value to most wildlife since they would be maintained as landscaped areas.

Activities associated with operation, such as noise and human activity, could affect wildlife living immediately adjacent to the proposed facility. These disturbances may cause some species to move from the area. Disturbance to wildlife living adjacent to the facility would be minimized by preventing workers from entering undisturbed areas. Salt drift generated by mechanical draft cooling systems would be minimal, and no impacts to natural vegetation are expected.

Wetlands. Because the majority of the area in which the proposed facility would be located is upland, it is expected that direct impacts to wetlands could be avoided. Implementation of erosion and sediment control measures would control secondary impacts. Since an existing intake structure would be used during both construction and operation, it would not be necessary to disturb wetlands along the Clinch River. However, a new discharge structure could be required on East Fork Poplar Creek. Depending on its location, this structure could displace some wetlands along the creek. Any potential impacts to wetlands resulting from construction activities would be mitigated in accordance with DOE policy set forth in 10 CFR 1022 and the requirements of a COE permit.

During construction and operation, discharges would be directed to East Fork Poplar Creek. Discharges would have a minimal impact on the flow of the stream and are not expected to affect associated wetlands. All wastewater discharges would be treated as necessary to meet NPDES permit requirements.

Aquatic Resources. Construction and operation of the consolidated storage facility could cause water quality changes (primarily sediment loading and resulting turbidity) to Bear Creek, Grassy Creek, or Ish Creek as a result of soil erosion. Soil erosion and sediment control measures would be implemented to control erosion. Water requirements during both construction and operation would be met by existing site sources. Since a new intake structure would not be required, direct disturbance to aquatic resources in the Clinch River would not occur. Water withdrawal during construction and operation would represent a very small percentage of the Clinch River's average flow and would have little affect on the flow of the river. Flow-related impacts to aquatic resources from increases in impingement and entrainment would be minimal and would be unlikely to affect fish populations in the river.

During construction and operation, wastewater would be discharged to East Fork Poplar Creek. This could require the construction of a new discharge structure that would temporarily disturb aquatic habitat in the vicinity of the outfall. The small volume of wastewater discharged to the stream would not be expected to affect aquatic resources during either construction or operation. In addition, all wastewater would be treated as necessary.

Threatened and Endangered Species. It is unlikely that federally listed threatened and endangered species would be affected by construction of the consolidated storage facilities. [Text deleted.] Land-clearing activities may destroy State-protected plant species found within or adjacent to disturbed portions of the proposed site including pink lady's-slippers, fen orchid, tubercled rein-orchid, American ginseng, purple fringeless orchid, Canada lily, and golden seal. The Tennessee dace is sensitive to siltation and actively seeks clean gravel for spawning. An increase in amount or duration of sediment runoff to Ish Creek or Bear Creek during facility construction could affect this fish species. Preactivity surveys would be conducted, as appropriate, prior to construction to determine the presence of special status species in the area to be disturbed. Consultation with USFWS and State agencies would be conducted at the site-specific level, as appropriate. No additional impacts are expected during operation of the facility. [Text deleted.]

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Impacts resulting from constructing and operating a new consolidated Pu storage facility and upgrading Y–12 would be similar to those discussed above for the new consolidated Pu storage facility. This is the case since upgrading Y–12 would not disturb any additional land area.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Under this alternative, consolidated Pu materials would be stored with HEU inventories in a new collocated storage facility(s) at ORR. Construction and operation of collocated storage facilities at ORR would have similar, but somewhat greater, effects on biological resources as those described for the new consolidated storage facility only. Construction of the collocated storage alternative would disturb 89.5 ha (221 acres) of habitat.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve and weapons R&D materials would have almost the same effects as the other facilities. The size of the facility would be similar, and would not reduce the area of disturbed habitat or lessen the potential impacts to biological resources for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

The phaseout of HEU storage facilities at ORR is not expected to affect biological resources although short-term increased human activity could temporarily disturb some wildlife species in the vicinity of the site.

4.2.5.7 Cultural and Paleontological Resources

No Action Alternative

Under this alternative, DOE would continue the existing and planned missions at ORR. This includes the continued storage of HEU material at Y–12 in stabilized form pursuant to DNFSB Recommendation 94-1. Any impacts to cultural or paleontological resources from these missions would be independent of the proposed action and would be addressed through separate NHPA, *American Indian Religious Freedom Act*, and *Native American Graves Protection and Repatriation Act* regulatory compliance procedures. In May 1994, a Programmatic Agreement was executed among the DOE Oak Ridge Operations Office, the Tennessee SHPO, and the Advisory Council on Historic Preservation regarding the management of historic and cultural properties at ORR. This agreement was administered to satisfy DOE's responsibilities regarding Sections 106 and 110 of the NHPA and requires DOE to develop a cultural resources management plan for ORR and conduct cultural resources surveys as required.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

Under this alternative, existing buildings would be modified at Y–12 to accommodate ORR nonsurplus HEU material. No additional land would be required for construction or operation of the facilities. New construction and building modification pose the greatest threat to prehistoric, historic, and paleontological resources. Operation would not have a direct effect on these resources. Impacts to archaeological and paleontological resources are not likely as a result of this alternative because it would involve the upgrade of five existing facilities (9212 E-Wing Vault, 9204-2 First Floor, 9202E First Floor, 9215, and 9998). Four of these facilities are NRHP-eligible historic resources based on their association with World War II. They would be part of a proposed Y–12 Plant National Register Historic District. No Native American resources have been identified at Y–12. Consequently, no impacts to Native American resources are expected to result under this alternative.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Under this alternative, a new facility would be constructed east of K–25 and west of ORNL to accommodate all Pu material within the scope of this PEIS and existing facilities at Y–12 would continue to store ORR nonsurplus HEU material. Land to be disturbed during the construction of this facility would total 58.5 ha (144 acres) and the total operational land disturbance would be 56 ha (138 acres). A reduced-access buffer zone would exist around the facility. [Text deleted.] Construction and operation can have an impact on Native American resources by affecting traditional plant and animal communities through construction and by reducing access to traditional use areas during operation. Paleontological resources can also be affected through new construction, however, those known to occur at ORR are relatively common fossils with low research potential.

Survey work would be conducted prior to construction to identify any cultural resources in the area. A portion of this area on both sides of Bear Creek Road was surveyed prior to construction of the proposed Exxon Nuclear Facility, which was never built (OR UTN 1975a:iii). Some prehistoric sites were identified near the Clinch River, and the potential for sites along the smaller creeks exists. In addition, remains of a number of early 20th-century frame houses and mid-to-late 19th-century log houses and outbuildings are located within the project area. Prehistoric site types that are known to occur at ORR include remains of prehistoric villages, burial grounds, quarries and lithic workshops, and shell scatters. One NRHP-eligible prehistoric site has been identified near K–25, on the Clinch River. Historic resources may include standing structures, as well as remains of dwellings, road traces, cemeteries, and trash scatters. Resources such as these may occur in the area to be

disturbed. Some Native American resources may be affected by construction and operation of the facility. These resources, should any exist, would be identified through consultation with the potentially affected tribes.

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

This alternative involves upgrades to facilities at Y–12 and the construction of a new Pu storage facility east of K–25 and west of ORNL. Land disturbance during construction would total 58.5 ha (144 acres). The operational land requirements would be 56 ha (138 acres). Impacts to cultural and paleontological resources at Y–12 would be similar to those described under the previously discussed Collocation Alternative, including creation of a 1.6-km (1-mi) buffer zone.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

This option involves the construction of a new facility east of K–25 and west of ORNL to accommodate all Pu and HEU material within the scope of this PEIS. Consequently, the land requirements during construction and operation are greater than those discussed under the previous collocation options. Construction of this facility would disturb 89.5 ha (221 acres) of land. The operational requirement would be 87 ha (215 acres). A reduced-access buffer zone would be created around the facility. Based on location and land requirements, the potential for impacts to cultural resources under this option would be similar to those described under the previous options. A slightly larger land requirement results in a slightly greater potential for impacts.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, facility and other resource requirements will be almost the same as the No Action Alternative, the Upgrade Alternative, and the Collocation Alternative. Therefore, impacts to cultural and paleontological resources would be equal to those previously discussed. [Text deleted.]

Phaseout

No acreage is expected to be disturbed during phaseout. Consequently, no impacts to archaeological sites or paleontological remains are anticipated. Some NRHP-eligible historic structures may be affected by this alternative, depending on the tasks involved with phaseout. No resources of Native American importance have been identified at Y–12, so impacts to these resources are not expected.

4.2.5.8 Socioeconomics

No Action Alternative

Regional Economy Characteristics. Total employment in the REA is projected to increase by approximately 1 percent annually between 1995 and 2000, reaching about 488,100 in the latter year. Long-range projections indicate slower growth after the year 2000, when employment would increase by less than 1 percent annually and reach approximately 665,000 in 2040. Unemployment in the REA was 4.9 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $18,190 in 1995 to $26,368 in 2040. Projections for the No Action Alternative are presented in Table L.1–46.

Population and Housing. Population in the ROI is projected to increase from approximately 518,600 in 1995 to 751,800 by 2040. The total number of available housing units in the ROI is projected to increase from about 214,700 in 1995 to 311,200 in 2040. Population and housing projections for the No Action Alternative are presented in Tables L.1–47 and L.1–48, respectively.

Community Services. Education, public safety, and health care characteristics are used to assess the level of community services in the ORR ROI. School enrollments are projected to increase from about 83,340 students in 1995 to 120,810 students by 2040. The current student-to-teacher ratio is 16.2:1. To maintain this level of service, the number of teachers in the ROI would need to increase from approximately 5,132 in 1995 to 7,442 in 2040. These projections are presented in Tables L.1–49 and L.1–50.

The projected numbers of sworn police officers and firefighters serving the ROI communities over the period 1995 to 2040 are shown in Tables L.1–51 and L.1–52, respectively. Under No Action, the number of sworn police officers is projected to increase from approximately 897 in 1995 to 1,299 in 2040 to maintain the current service level of 1.7 sworn officers per 1,000 persons. The number of firefighters in the ROI would need to increase from about 1,120 in 1995 to 1,624 in 2040 to maintain the present service level of 2.2 firefighters per 1,000 persons.

Hospital occupancy rates are based on current capacity. These rates and the estimated number of physicians serving the ROI population between 1995 and 2040 are presented in Tables L.1–53 and L.1–54, respectively. Hospital occupancy rates are projected to increase from approximately 65 percent in 1995 to about 93 percent in 2040. To maintain the current physician-to-population ratio of 2.5 physicians per 1,000 persons, the total number of physicians in the ROI would need to increase from approximately 1,322 in 1995 to 1,917 in 2040.

Local Transportation. Any increases in traffic would be due to projected growth in the area unrelated to DOE activity. [Text deleted.]

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

Of all the long-term storage alternatives being considered at ORR, the upgrade existing HEU storage facilities option would create the smallest socioeconomic changes within the region. This alternative would generate a total of 132 jobs (66 direct and 66 indirect) during construction and a total of 395 jobs (111 direct and 284 indirect) during operation. In both phases, there would be sufficient available labor in the REA to fill both direct and indirect jobs created from this alternative. Therefore, no workers would in-migrate to the REA and no change to the REA population would result beyond No Action projections.

Regional Economy Characteristics. Due to the small number of workers required during construction and operation phases, the regional economy would remain virtually unchanged compared to No Action projections. Total employment would increase by much less than 1 percent during construction and operation of the facilities. Unemployment would decrease from 4.9 to 4.8 percent during construction and operation. Per capita income would also remain virtually unchanged, increasing by much less than 1 percent over the No Action alternative (Socio 1996a).

Population and Housing, Community Services, and Local Transportation. All newly created employment would be filled by the resident labor force. Therefore, there would be no change to the region's population beyond the No Action level. Accordingly, minimal impacts to the housing sector, community services, or local transportation would occur as a result of the construction and operation of these facilities.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

To consolidate storage of Pu currently stored at multiple DOE sites, a new storage facility would need to be constructed at ORR. Existing buildings at Y–12 would continue to store ORR nonsurplus HEU material. Workers would in-migrate to fill a portion of the direct jobs created during construction and operation of this facility.

Regional Economy Characteristics. Construction would generate a total of 2,226 jobs (1,115 direct and 1,111 indirect). Operation of the facility would generate a total of 1,575 jobs (443 direct and 1,132 indirect). Total employment would increase by less than 1 percent over No Action projections during both construction and operation. Unemployment would decrease to 4.4 percent during construction and 4.6 percent during operation. Per capita income would increase by much less than 1 percent during both phases (Socio 1996a).

Population and Housing. The in-migration of workers during the construction and operation periods would increase the ROI population by much less than 1 percent over No Action projections. The larger increase would occur during construction. Some new housing may be needed. However, expected vacancies and historic housing construction rates indicate that housing would be available to accommodate the population growth (Socio 1996a).

Community Services. The ROI population growth would slightly increase the demand for some community services. Worker in-migration would lead to an increase in ROI school enrollments by about 40 students during construction and 2 students during operation. To maintain the No Action student-to-teacher ratio of 16.2:1, the number of teachers would have to increase by three during the construction period. Operation would not require any additional teachers (Socio 1996a). This additional need for teachers would be distributed over the various jurisdictions in the ROI, so the effect on any single school district would be minimal.

To maintain No Action level of service, no police officers and one firefighter would need to be hired during the construction period. No additional police officers or firefighters would be required to maintain No Action service levels during operation (Socio 1996a).

The small population increase would have a negligible effect on health services, increasing hospital occupancy by much less than 1 percent during construction and operation. The number of physicians in the ROI would need to increase by only one during construction to maintain the No Action service level. No additional physicians would be needed during operation (Socio 1996a).

Local Transportation. A total of 2,141 and 851 vehicle trips per day would be generated during the construction and operation phases, respectively. During construction, there would be a noticeable increase in the

volume-to-capacity ratio of Tennessee State Route 62, between Tennessee State Route 95 and Tennessee State Route 170. The road segment however, would continue to operate at level of service F, the lowest level of service. Traffic generated from facility operations would not affect the level of service on the road segments analyzed (Socio 1996a).

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

To consolidate storage of Pu currently stored at multiple DOE sites and improve HEU storage, a new Pu storage facility would need to be constructed and existing HEU facilities upgraded at ORR. Workers would in-migrate to fill a portion of the direct jobs created during construction and operation of these facilities.

Regional Economy Characteristics. Construction would generate a total of 2,316 jobs (1,155 direct and 1,161 indirect). Operation would generate a total of 1,969 jobs (554 direct and 1,415 indirect). Total employment would increase by less than 1 percent over No Action projections during both construction and operation. Unemployment would decrease from 4.9 percent to 4.4 percent during construction and 4.5 percent during operation. Per capita income would increase by less than 1 percent during both phases (Socio 1996a).

Population and Housing. The in-migration of workers during the construction and operation periods would increase the ROI population by much less than 1 percent over No Action projections. The larger increase would occur during construction. Some new housing may be needed. However, expected vacancies and historic housing construction rates indicate that housing would be available to accommodate the population increase (Socio 1996a).

Community Services. The additional population would slightly increase the demand for some community services. Worker in-migration would lead to an increase in ROI school enrollments by about 62 students during construction and 8 students during operation. To maintain the No Action student-to-teacher ratio of 16.2:1, the number of teachers would have to increase by four during the construction period. Operation would not require any additional teachers (Socio 1996a). This additional need for teachers would be distributed over the various jurisdictions in the ROI, so the effect on any single school district would be minimal.

To maintain No Action levels of service, two police officers and three firefighters would need to be hired during the construction period. No additional police officers or firefighters would be required to maintain No Action service levels during operation (Socio 1996a).

The small population increase would have a negligible effect on health services, increasing hospital occupancy by much less than 1 percent during construction and operation. The number of physicians in the ROI would need to increase by three during construction to maintain the No Action service level. No additional physicians would be needed during operation (Socio 1996a).

Local Transportation. A total of 2,337 and 1,064 vehicle trips per day would be generated during the construction and operation phases, respectively. During construction there would be a noticeable increase in the volume-to-capacity ratio of Tennessee State Route 62, between Tennessee State Route 95 and Tennessee State Route 170. The road segment however, would continue to operate at level of service F, the lowest level of service. Traffic generated from facility operations would not affect the level of service on the local road segments analyzed (Socio 1996a).

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

To consolidate storage of Pu and HEU currently stored at multiple DOE sites, new storage facilities would need to be constructed at ORR. Workers would in-migrate to fill a portion of the direct jobs created during construction and operation of these facilities.

Regional Economy Characteristics. Construction would generate a total of 3,063 jobs (1,534 direct and 1,529 indirect). Operation would generate a total of 2,012 jobs (566 direct and 1,446 indirect). Total employment would increase by less than 1 percent over No Action projections during both construction and operation. Unemployment would decrease to 4.4 percent during construction and 4.5 percent during operation. Per capita income would increase by less than 1 percent during both phases (Socio 1996a).

Population and Housing. The in-migration of workers during the construction and operation periods would increase the ROI population by less than 1 percent over No Action projections. The larger increase would occur during construction. Some new housing may be needed. However, expected vacancies and historic housing construction rates indicate that housing would be available to accommodate the population growth (Socio 1996a).

Community Services. The ROI population growth would slightly increase the demand for some community services. Worker in-migration would lead to an increase in ROI school enrollments by about 223 students during construction and 6 students during operation. To maintain the No Action student-to-teacher ratio of 16.2:1, the number of teachers would have to increase by 14 during the construction period. Operation would not require any additional teachers (Socio 1996a). This additional need for teachers would be distributed over the various jurisdictions in the ROI, so the effect on any single school district would be minimal.

To maintain No Action level of service, only one police officer and firefighter would need to be hired during the construction period. No additional police officers or firefighters would be required to maintain No Action service levels during operation (Socio 1996a).

The small population increase would have a negligible effect on health services, increasing hospital occupancy by much less than 1 percent during construction and operation. The number of physicians in the ROI would need to increase by only one during construction to maintain the No Action service level. No additional physicians would be needed during operation (Socio 1996a).

Local Transportation. A total of 2,945 and 1,087 vehicle trips per day would be generated during construction and operation, respectively. During construction there would be a noticeable increase in the volume-to-capacity ratio of Tennessee State Route 62, between Tennessee State Route 95 and Tennessee State Route 170. The road segment however, would continue to operate at level of service F, the lowest level of service. Traffic generated from facility operations would not affect the level of service on the road segments analyzed (Socio 1996a).

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The requirements for each storage option considered would decrease slightly if strategic reserve and weapons R&D materials were not included for storage at ORR. This should result in a decrease in the number of required operation employees for each of the considered alternatives. Therefore, socioeconomic effects on the REA/ROI for the storage alternatives with no strategic reserve and weapons R&D materials should be equal to, or somewhat less than, the No Action Alternative, the Upgrade Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

Phasing out HEU storage at ORR would result in the loss of 476 total (direct and indirect) jobs in the REA. Should all personnel be phased out at the same time, unemployment would remain at the No Action estimate of 4.9 percent and per capita income would be reduced by much less than 1 percent (Socio 1996a).

Some displaced workers may out-migrate from the ROI to seek other employment opportunities. Under the bounding case (all unemployed workers and their families leaving the ROI at the same time), population would

decrease by less than 1 percent. Some of the projected ROI occupied housing units would likely become vacant as a result of population losses (Socio 1996a).

The out-migration of population during phaseout would slightly lessen the demand for community services. It is unlikely that communities would lower service levels unless decreased revenues made it necessary.

Region of influence school enrollments are projected to decrease by much less than 1 percent during the bounding case scenario for phaseout. The No Action student-to-teacher ratio of 16.2:1 could be maintained if the number of teachers does not decrease from predicted No Action levels by more than 13 (Socio 1996a).

During phaseout, the number of sworn police officers could not decrease from predicted No Action levels if the No Action service level of 1.7 officers per 1,000 persons were to be maintained. The number of firefighters could decrease by one before the No Action service level of 2.2 firefighters per 1,000 persons would be affected (Socio 1996a).

Projected hospital occupancy rates during the bounding case scenario for phaseout would be slightly lower than the No Action projections. The number of physicians in the ROI could decrease by three from predicted No Action levels before the No Action service level of 2.6 physicians per 1,000 persons would be affected (Socio 1996a).

Phaseout would result in the loss of 129 vehicle trips per day. There would be no significant effect to the local road network due to this activity (Socio 1996a).

4.2.5.9 Public and Occupational Health and Safety

The assessments of potential radiological and chemical impacts associated with the storage alternatives at ORR are presented in this section. Summaries of radiological impacts from normal operations are presented in Tables 4.2.5.9–1 and 4.2.5.9–2 for the public and workers, respectively. Impacts from hazardous chemicals are presented in Table 4.2.5.9–3. Summaries of impacts associated with postulated accidents are presented in Table 4.2.5.9–4. Detailed results are presented in Appendix M.

No Action Alternative

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from normal operations involved with the current ORR sitewide missions, including interim storage of HEU. The impacts would be within applicable regulatory limits. For facility accidents, the risks and consequences are described in site safety documentation.

Normal Operation. The current mission at ORR, where HEU is in interim storage, is described in Section 3.6. The site has identified those facilities that will continue to operate under the No Action Alternative, including interim HEU storage facilities and others, if any, that will become operational by 2005. Based on that information, the radiological and chemical releases to the environment in 2005 and beyond (future operation) were developed and used in the impact assessments. The resulting doses and potential health effects to the public and workers at ORR are described below.

Radiological Impacts. The calculated annual dose to the average and maximally exposed member of the public from total site operation; the associated fatal cancer risks to these individuals from 50 years of operation; the dose to the population within 80 km (50 mi) from total site operation in the year 2030; and the projected number of fatal cancers in this population from 50 years of operation are presented in Table 4.2.5.9–1 under this alternative at ORR. The annual dose of 3.2 mrem to the MEI is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 8.0×10^{-5}. This activity would be included in a program to ensure that doses to the public are ALARA. The annual dose of 34 person-rem to the population would be within the limit in proposed 10 CFR 834. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.85. To put operational doses into perspective, comparisons with natural background radiation doses are included in the table. The doses and projected fatal cancers associated with the storage component of the No Action Alternative are included in Table 4.2.5.9–1. These are seen to be much lower than those from total site operations.

Under the No Action alternative shown in Table 4.2.5.9–2, the average annual dose to a noninvolved (No Action) site worker and the annual dose to the noninvolved (No Action) total site workforce would be 2.6 mrem and 44 person-rem, respectively. The associated risk of fatal cancer to the average worker from 50 years of total site operations would be 5.2×10^{-5}, and the projected number of fatal cancers among all workers from 50 years of total site operations would be 0.88.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from the normal operation under No Action at ORR are presented in Table 4.2.5.9–3. The hazardous chemical impacts from current site operations were used to estimate the baseline site impacts for the various storage alternatives. The noncancer health effects expected and the risk of cancer due to the total chemical exposures were estimated for each site. Since the major releases due to normal operation at ORR would make up nearly all of the exposures to onsite workers and to the public in adjacent communities, contributions to the hazardous chemical concentrations from all other sources, for example, industrial operations, are considered negligible for purposes of risk calculations.

Table 4.2.5.9–1. Potential Radiological Impacts to the Public During Normal Operation at Oak Ridge Reservation—No Action and Storage Alternatives

Receptor	No Action		Upgrade		Collocation[a]	
	Storage Facility	Total Site[b]	Storage Facility[c]	Total Site[b]	Storage Facility	Total Site[b]
Annual Dose to the Maximally Exposed Individual Member of the Public[d]						
Atmospheric release pathway (mrem)	$1.4x10^{-3}$	1.5	$2.2x10^{-7}$	1.5	$4.5x10^{-5}$	1.5
Drinking water pathway (mrem)	0	0.10	0	0.10	0	0.10
Total liquid release pathway (mrem)	0	1.7	0	1.7	0	1.7
Atmospheric and liquid release pathways combined (mrem)	$1.4x10^{-3}$	3.2	$2.2x10^{-7}$	3.2	$4.5x10^{-5}$	3.2
Percent of natural background[e]	$4.7x10^{-4}$	1.1	$7.4x10^{-8}$	1.1	$1.5x10^{-5}$	1.1
50-year fatal cancer risk	$3.5x10^{-8}$	$8.0x10^{-5}$	$5.5x10^{-12}$	$8.0x10^{-5}$	$1.1x10^{-9}$	$8.0x10^{-5}$
Population Dose Within 80 Kilometers for Year 2030[f]						
Atmospheric release pathway (person-rem)	0.022	29	$3.4x10^{-6}$	29	$8.7x10^{-4}$	29
Total liquid release pathway (person-rem)	0	4.7	0	4.7	0	4.7
Atmospheric and liquid release pathways combined (person-rem)	0.022	34	$3.4x10^{-6}$	34	$8.7x10^{-4}$	34
Percent of natural background[e]	$5.8x10^{-6}$	$9.0x10^{-3}$	$9.0x10^{-10}$	$9.0x10^{-3}$	$2.3x10^{-7}$	$9.0x10^{-3}$
50-year fatal cancers	$5.5x10^{-4}$	0.85	$8.5x10^{-8}$	0.85	$2.2x10^{-5}$	0.85
Annual Dose to the Average Individual Within 80 Kilometers[g]						
Atmospheric and liquid release pathways combined (mrem)	$1.7x10^{-5}$	0.026	$3.0x10^{-9}$	0.026	$6.8x10^{-7}$	0.026
50-year fatal cancer risk	$4.3x10^{-10}$	$6.6x10^{-7}$	$6.6x10^{-14}$	$6.6x10^{-7}$	$1.7x10^{-11}$	$6.6x10^{-7}$

[a] The impacts to the public would be virtually the same whether the Pu and HEU are stored in a new consolidated and collocated HEU storage facility or whether the Pu is stored in a new facility and the HEU remains stored in the existing or modified Y–12 Plant (refer to the text).

[b] Includes impacts from No Action facilities. The location of the MEI may be different under No Action than for the other alternatives. Therefore, the impacts may not be directly additive.

[c] The impacts from the upgrade facility would be virtually the same as the impacts from storage under the No Action Alternative (OR MMES 1996a).

[d] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways as required by NESHAPS (40 CFR 61, Subpart H) under the CAA; 4 mrem per year from the drinking water pathway as required by the SDWA; and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[e] The annual natural background radiation level at ORR is 295 mrem for the average individual; the population within 80 km in the year 2030 receives 379,000 person-rem.

[f] For DOE activities, proposed 10 CFR 834 (see 58 FR 16268) would generally limit the potential annual population dose to 100 person-rem from all pathways combined, and would require an ALARA program.

[Text deleted.]

[g] Obtained by dividing the population dose by the number of people projected to live within 80 km of ORR in 2030 (1,285,000).

Source: Section M.2.

Table 4.2.5.9–2. Potential Radiological Impacts to Workers During Normal Operation at Oak Ridge Reservation—Storage Alternatives

Receptor	Upgrade	Collocation[a]
Involved Workforce[b]		
Average worker dose (mrem/yr)[c]	28	264
50-year risk of fatal cancer	5.6×10^{-4}	5.3×10^{-3}
Total dose (person-rem/yr)	3	25
50-year fatal cancers	0.060	0.50
Noninvolved Workforce[d]		
Average worker dose (mrem/yr)[c]	2.6	2.6
50-year risk of fatal cancer	5.2×10^{-5}	5.2×10^{-5}
Total dose (person-rem/yr)	44	44
50-year fatal cancers	0.88	0.88
Total Site Workforce[e]		
Dose (person-rem/yr)	47	69
50-year fatal cancers	0.94	1.4

[a] The impacts are assumed to be the same for each of the three collocation storage options (refer to text).

[b] The involved worker is associated with operations of the proposed action. The maximum dose to the involved worker would be kept below 500 mrem per year. Based on a review of worker doses associated with similar operations (Section M.2.3.2), an average worker dose of 28 mrem per year was assumed. However, an effective ALARA program will ensure that the exposure will be reduced to that level which is as low as reasonably achievable. The number of involved badged workers for the upgrade and collocation alternatives would be 111 and 95, respectively.

[c] The radiological limit for an individual worker is 5,000 mrem/year (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem per year (DOE 1992t); the site must make reasonable attempts to maintain worker doses below this level.

[d] The noninvolved worker is onsite but not associated with operations of the proposed action. The projected number of noninvolved badged workers in 2005, is 17,200. The Noninvolved Workforce is equivalent to the No Action workforce.

[e] The impact to the total site workforce is the summation of the involved worker impact and the noninvolved worker impact.

[Text deleted.]

Section M.2.

The HI to the MEI of the public at ORR resulting from normal operation under the No Action Alternative is 4.0×10^{-2}, and the cancer risk is zero (because no carcinogens are introduced). The HI to the onsite worker is 0.15, and the cancer risk is zero (because no carcinogens are introduced).

Facility Accidents. Under the No Action Alternative, uranium would continue to be stored at the ORR site in existing facilities. These facilities currently operate in accordance with DOE safety orders which ensure that the risk to the public of prompt fatalities due to accidents or cancer fatalities due to operations will be minimized. The safety to workers and the public from accidents at existing facilities is also controlled by Technical Safety Requirements specified in detail in SARs or a Basis for Interim Operations document prepared and maintained specifically for a facility or process within a facility. Under these controls, any change in approved operations or to facilities would cause a halt in operations until it can be established that worker and public safety has not been compromised.

Upgrade Alternative

[Text deleted.]

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with upgraded existing HEU storage facilities at ORR. The section describes the impacts from normal facility operations at ORR, then impacts of facility accidents.

Table 4.2.5.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation at Oak Ridge Reservation—No Action and Storage Alternatives

Receptor	No Action	Upgrade		Collocation			
				Construct New Pu Facility and Modify Existing HEU Facility		Construct New Pu and HEU Facilities	
	Total Site[a]	Facility[b]	Total Site[a]	Facility[b]	Total Site[a]	Facility[b]	Total Site[a]
Maximally Exposed Individual (Public)							
Hazard index[c]	4.0×10^{-2}	8.6×10^{-5}	4.0×10^{-2}	7.1×10^{-5}	4.0×10^{-2}	1.5×10^{-4}	4.0×10^{-2}
Cancer risk[d]	0	0	0	1.6×10^{-7}	1.6×10^{-7}	1.6×10^{-7}	1.6×10^{-7}
Worker Onsite							
Hazard index[e]	0.15	5.7×10^{-4}	0.15	8.1×10^{-4}	0.15	1.3×10^{-3}	0.15
Cancer risk[f]	0	0	0	1.3×10^{-5}	1.3×10^{-5}	1.3×10^{-5}	1.3×10^{-5}

[a] Total=Sum of the No Action plus the contributions of the above activity.

[b] Contribution from the above activity only (for example, the amount of increase over the existing, No Action level at the site).

[c] Hazard index for MEI=Sum of individual Hazard Quotients (noncancer health effects) for MEI.

[d] Cancer risk for MEI=(Emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (slope factor [SF]).

[e] Hazard index for workers=Sum of individual Hazard Quotients (noncancer health effects) for workers.

[f] Cancer risk for workers=(Emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237[fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (SF).

Note: Where there are no known carcinogens among the hazardous chemicals emitted, there are no slope factors, therefore the calculated cancer risk value is 0.

Source: Section M.3, Tables M.3.4–18 through M.3.4–21.

During normal operation at ORR, the operation of the upgraded Y–12 Plant would result in impacts that are within applicable regulatory limits.

Normal Operation. There would be no radiological releases during the upgrading of existing storage facilities at ORR. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct exposures. The resulting doses and potential health effects to the public and workers at ORR are described below.

Radiological Impacts. Doses to the public from upgraded storage would be slightly less than for storage under No Action, as shown in Table 4.2.5.9–1. This is because the upgraded storage facility safety and design features would improve, although the quantity of stored material would be the same as for the No Action Alternative, the distance to the MEI and the public would not change appreciably, and the population density would not change. Therefore, the risks and numbers of fatal cancers among the public would remain essentially the same as under the No Action Alternative. [Text deleted.] Total site doses to the MEI and the public are expected to be similar because storage represents a small contribution to the total site.

The dose to the MEI from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 3.2 mrem. From 50 years of operations, the corresponding risk of fatal cancer to this individual would be 8.0×10^{-5}. These values are presented in Table 4.2.5.9–1. The impacts to the average member of the public would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operations in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 34 person-rem. The corresponding number of fatal cancers in this population from 50 years of total site operation would be 0.85.

Facility and total site doses to onsite workers from normal operations are given in Table 4.2.5.9–2. Included are involved workers directly associated with the upgraded Y–12 storage plant, workers who are not involved with this plant, and the entire workforce at ORR. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the upgraded storage facilities at ORR are presented in Table 4.2.5.9–3. The impacts from all site operations, including the upgraded storage facilities are also included in this table. Total site impacts, which include the No Action impact plus the facility impacts, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 8.6×10^{-5}, and the cancer risk would be zero (because no carcinogens are introduced) as a result of operation of the upgraded storage facilities, in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the upgrade facility, would result in an HI of 4.0×10^{-2} and a cancer risk of zero (because no carcinogens are introduced) for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 5.7×10^{-4} and the cancer risk would be zero as a result of operation of the upgraded storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation because exposures would be expected to remain the same. The total site operation, including the

upgrade facility, would result in an HI of 0.15 and a cancer risk of zero for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. Under the Preferred Alternative at ORR, nonsurplus HEU and surplus HEU pending disposition would remain in storage at Y–12 in existing and upgraded storage facilities. Upgrades for HEU storage in Building 9212, the building used in the Y–12 EA accident analysis, would include structural modifications to numerous columns, knee braces, and cross braces to provide proper stiffness and load distribution as documented in *Natural Phenomena Upgrade of the Downsized/Consolidated Oak Ridge Uranium/Lithium Plant Facilities* (Y/EN-5080, 1994). Appendix G of the Y–12 EA contains a list of buildings and the modifications required to bring the buildings into conformance with the target performance goal that is equivalent to the structural response of new facilities. The modifications made to these facilities are expected to result in a reduction in risk of accidents to workers and the public for equivalent quantities of stored HEU. Modification to these facilities would ensure that long-term storage would be in accordance with DOE Orders, and that the risks to the public of prompt fatalities due to accidents and of latent cancer fatalities due to normal operations would be minimized. These structural modifications would reduce the risk from seismic initiators such as a beyond design basis earthquake scenario.

Buildings included in the upgrade for long-term storage at Y–12, as described in Section 2.3.1, would be evaluated by analyses employing methodologies outlined in DOE Order 5480.21, Unreviewed Safety Questions; DOE Order 5480.22, Technical Safety Requirements; and DOE Order 5480.23, Nuclear Safety Analysis Reports. Facilities and buildings within Y–12 that contain substantial quantities of enriched uranium have DOE-approved SARs that are currently undergoing review in an SAR Update Program to meet requirements of new DOE Orders (OR DOE 1994:E-3). The SAR Update Program would reflect the long-term storage upgrade at Y–12 in a Conceptual Design Report for these structural modifications as part of the Stockpile Management Restructuring Initiative that DOE is pursuing.

One of the natural phenomena initiators of accident scenarios analyzed (nuclear criticality, fire, and mechanical upset) in the Y–12 EA included a design basis accident earthquake. For the earthquake scenario, the present evaluation criterion for the design basis earthquake corresponds to a hazard exceedance frequency of 5×10^{-4} per year. The Y–12 long-term storage buildings would be upgraded to meet the performance goal for a moderate hazard facility of Performance Category 3 in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*. The Performance Category 3 facility poses a potential hazard to worker and public health and safety and to the environment because radioactive or toxic materials are present in significant quantities. Design considerations for this category are to limit facility damage so that hazardous materials can be controlled and confined, occupants are protected, and functioning of this facility is not interrupted. A performance goal for Performance Category 3 is a hazard exceedance frequency of 1×10^{-4} per year (DOE Order 5480.28). Meeting this performance goal would reduce the expected risk for the design basis accidents analyzed in the Y–12 EA for Building 9212 by approximately 80 percent, resulting in a latent cancer fatality risk of 5.1×10^{-7} to the MEI and 5.7×10^{-8} to a noninvolved worker, and potential latent cancer fatalities of 7.4×10^{-6} for the 80-km (50-mi) offsite population.

The HEU EIS describes the disposition of surplus HEU currently stored at ORR. As surplus HEU is removed for disposition, the quantity of material in storage would be reduced, and therefore fewer buildings would be needed for storage. As this a reduction in the storage footprint, the risk would be reduced accordingly. The combination of upgrading the buildings with structural modifications (as discussed above) and reducing the storage footprint as surplus HEU disposition continues are expected to result in overall reduction in the risk to the public and workers from facility accidents.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Prior to construction of a new modification of an existing facility, DOE Orders

require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Collocation Alternative

[Text deleted.]

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Normal Operation. There would be no radiological releases during the construction of a new Pu storage facility at ORR. Construction worker exposures to materials potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct exposures. The resulting doses and potential health effects to the public and workers at ORR are described below.

Radiological Impacts. Since the storage of the HEU contributes negligibly to the offsite radiological impacts, this alternative would result in impacts to the public that would be virtually the same as those associated with storage in a new consolidated and collocated Pu and HEU storage facility (refer to Table 4.2.5.9–1 and the discussions of the new Pu and HEU storage facilities). Radiological impacts to workers would also be expected to be the same (refer to Table 4.2.5.9–2).

Hazardous Chemical Impacts. Impacts to the public and to the onsite worker resulting from the normal operations of the new consolidated Pu storage facility and existing HEU storage facility at Y–12 are the same, or less than, those impacts shown in Table 4.2.5.9–3 for the Collocation Alternative (construct new Pu facility and modify existing HEU facility). Total site impacts shown in the table are the sum of the impacts under No Action plus the impacts due to the additional consolidated storage facility and any incremental impacts from the modified facility over the existing HEU storage facilities at the Y–12 Plant.

Facility Accidents. A set of potential accidents have been postulated for collocation of Pu and HEU for which there may be releases of Pu or HEU that may affect onsite workers and the offsite population. Impacts of accidents that release both Pu and HEU are bounded by the impacts due to Pu exposure. The accident consequences and risks to a worker located 619 m (2,030 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Table 4.2.5.9–4. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 4.9 at ORR for the beyond design basis earthquake accident scenario with an estimated probability of 1.0×10^{-7} per year (that is, probability of severe earthquake occurring is estimated to be about 1.0×10^{-5}, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 619 m (2,030 ft), would be 2.5×10^{-5}, 2.0×10^{-7}, and 1.6×10^{-7}, respectively. The maximum population 50-year facility lifetime risk would be 0.017 (that is, one fatality in about 2,900 years) at ORR for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 9.9×10^{-5}, and 7.9×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.5.9–4.

Table 4.2.5.9–4. Collocation Alternative Accident Impacts at Oak Ridge Reservation

	Worker at 619 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatalities (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift impact	1.8×10^{-7}	6.0×10^{-6}	2.3×10^{-7}	7.5×10^{-6}	3.9×10^{-5}	1.3×10^{-3}	6.0×10^{-4}
PCV breach by firearms discharge	1.1×10^{-8}	6.0×10^{-7}	1.3×10^{-8}	7.5×10^{-7}	2.3×10^{-6}	1.3×10^{-4}	3.5×10^{-4}
PCV penetration by corrosion	7.9×10^{-5}	2.5×10^{-5}	9.9×10^{-5}	3.1×10^{-5}	1.7×10^{-2}	5.3×10^{-3}	0.064
Vault fire	7.8×10^{-8}	0.016	9.7×10^{-8}	0.019	1.4×10^{-5}	2.7	1.0×10^{-7}
Truck bay fire	4.2×10^{-9}	8.4×10^{-4}	5.3×10^{-9}	1.1×10^{-3}	9.1×10^{-7}	0.18	1.0×10^{-7}
Spontaneous combustion	4.2×10^{-11}	1.2×10^{-6}	5.3×10^{-11}	1.5×10^{-6}	9.1×10^{-9}	2.6×10^{-4}	7.0×10^{-7}
Explosion in the vault	9.9×10^{-9}	2.0×10^{-3}	1.2×10^{-8}	2.5×10^{-3}	2.1×10^{-6}	0.43	1.0×10^{-7}
Explosion outside the vault	4.5×10^{-11}	9.0×10^{-6}	5.6×10^{-11}	1.1×10^{-5}	9.8×10^{-9}	2.0×10^{-3}	1.0×10^{-7}
Nuclear criticality	2.8×10^{-11}	5.5×10^{-6}	3.5×10^{-11}	6.9×10^{-6}	2.1×10^{-9}	4.1×10^{-4}	1.0×10^{-7}
Beyond design basis earthquake	1.6×10^{-7}	0.033	2.0×10^{-7}	0.044	2.5×10^{-5}	4.9	1.0×10^{-7}
Expected risk[d]	7.9×10^{-5}	–	9.9×10^{-5}	–	1.7×10^{-2}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary [619 m for the facility at ORR], whichever is smaller or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risks is the sum of the risks over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.2.1–3 and M.5.2.2.1–4 and the MACCS computer code.

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Normal Operation. There would be no radiological releases during the construction of a new Pu storage facility and modification of the existing Y–12 Plant at ORR. Construction worker exposures to materials potentially contaminated with radioactivity would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct exposures. The resulting doses and potential health effects to the public and workers at ORR are described below.

Radiological Impacts. Because the storage of the HEU contributes negligibly to offsite radiological impacts, this alternative would also result in impacts to the public that would be virtually the same as those associated with storage in a new consolidated and collocated Pu and HEU storage facility (refer to Table 4.2.5.9–1 and the discussion of the new Pu and HEU storage facilities). Radiological impacts to workers would also be expected to be the same (refer to Table 4.2.5.9–2).

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the new consolidated Pu storage facility and modified Y–12 Plant at ORR are presented in Table 4.2.5.9–3. The impacts from all site operations, including the consolidation of a Pu facility, are also included in this table. Total site impacts, which include the No Action impact plus the facility impacts are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 7.1×10^{-5}, and the cancer risk is 1.6×10^{-7} as a result of operation of the new consolidation of Pu facility in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the consolidation of Pu facility, would result in an HI of 4.0×10^{-2} and a cancer risk of 1.6×10^{-7} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 8.1×10^{-4}, and the cancer risk is 1.3×10^{-5} as a result of operation of the new consolidation of Pu facility in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in an HI of 0.15 and a cancer risk of 1.30×10^{-5} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. Under this alternative, the impacts of accidents are bounded by the impacts shown in Table 4.2.5.9–4 and are similar to those described in the construct new Pu storage facility; maintain existing HEU storage facilities at Y–12.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Prior to construction of a new modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

This section includes a description of radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the consolidation of Pu storage and collocation with HEU storage facilities at ORR. This storage would take place in a new consolidated Pu and HEU storage facility.

Normal operation of the new storage facility at ORR would result in impacts that are within applicable regulatory limits.

Normal Operation. There would be no radiological releases during the construction of a new Pu and HEU storage facility at ORR. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers are described below.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new Pu and HEU storage facility at ORR are presented in Table 4.2.5.9–1. The impacts from all site operations, including the new storage facility, are also given in the table. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The dose to the MEI from annual storage facility operation would be 4.5×10^{-5} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.1×10^{-9}. The impacts to the average member of the public would be less. As a result of storage facility operation in the year 2030, the population dose would be 8.7×10^{-4} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 2.2×10^{-5}.

The dose to the MEI of the public from annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 3.2 mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 8.0×10^{-5}. The impacts to the average member of the public would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 34 person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.85.

Facility and total site doses to onsite workers from normal operations are given in Table 4.2.5.9–2. Included are involved workers directly associated with the new storage facility, workers who are not involved with the storage facility, and the entire workforce at ORR. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the new consolidation of Pu and collocation with HEU storage facilities at ORR are presented in Table 4.2.5.9–3. The impacts from all site operations, including the consolidation of Pu and

collocation with HEU storage facilities, are also included in this table. Total site impacts, which include the No Action impact plus the facility impacts, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 1.5×10^{-4}, and the cancer risk is 1.6×10^{-7} as a result of operation of the consolidation of Pu and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the consolidation of Pu and collocation with HEU storage facilities, would result in an HI of 4.0×10^{-2} and a cancer risk of 1.6×10^{-7} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 1.3×10^{-3} and the cancer risk is 1.3×10^{-5} as a result of operation of the new consolidation of Pu and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in an HI of 0.15 and a cancer risk of 1.3×10^{-5} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. Under this alternative, the impacts of accidents are bounded by the impacts shown in Table 4.2.5.9–4 and are similar to those described in the construct new Pu storage facility; maintain existing HEU storage facilities at Y–12.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions and criticality could cause fatalities to workers close to the accident. Prior to construction of a new modification of an existing facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

If the strategic reserve and weapons R&D materials are not included, the impacts to the public and to workers from the accident-free storage activities would be reduced in proportion to the decrease in the amount of material stored. The impacts from total site operations would decrease slightly. The risks of accidents would also tend to be lower.

Phaseout

Normal Operations. A phaseout of existing HEU storage facilities at ORR would reduce the impacts from radiological and chemical releases and exposures to levels very slightly below the No Action levels. As shown in Table 4.2.5.9–1, the radiological dose to the MEI from annual operations would be reduced by 1.4×10^{-3} mrem; the dose to the population would be reduced by 0.022 person-rem. The associated reductions in fatal cancer are included in the table. All workers involved in the transfer of the HEU from existing storage would be monitored to assure that their doses remain within regulatory limits and ALARA.

Facility Accidents. The phaseout operation will be conducted in accordance with DOE 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. For current operations in the facility that would be phased out, the safety of workers and the public from accidents is controlled by Technical Safety Requirements that are specified in SARs or Basis for Interim Operations documents that have been prepared for the facility. Prior to initiating phaseout, the potential for accidents that could impact workers and the public will be assessed and, if necessary, applicable existing safety documentation will be modified to ensure safety for workers and the public.

4.2.5.10 Waste Management

This section summarizes the impacts on waste management at ORR under No Action and for each of the long-term storage alternatives to include the phaseout of HEU storage. There is no spent nuclear fuel or HLW associated with Pu or HEU storage. Table 4.2.5.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action for the ORR for 2005. Projections for No Action were derived from the most recent available environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated were identifiable. The projection does not include wastes from future, yet uncharacterized, environmental restoration activities. The projections for No Action could change significantly depending on the decisions resulting from the PEIS on waste management being prepared by the Department. Table 4.2.5.10–2 provides the estimated incremental operational waste volumes projected to be generated at ORR as a result of the various storage alternatives prior to treatment. Some of the waste values described in this section are different than the waste values in the table. For those values that differ (for example LLW), the table gives waste generated pre-treatment values and the text discusses post-treatment values (indicated as after treatment and volume reduction). For example, the collocated new Pu storage facility and new HEU storage facility would generate 2.1 m^3 (555 gal) of liquid LLW. Since ORR already stores HEU, the waste volumes associated with the phaseout of HEU storage (0.4 m^3 [106 gal]) must be subtracted out to avoid double counting waste volumes associated with HEU storage. This results in a net incremental increase from the alternative of 1.7 m^3 (449 gal). The subtraction of phaseout volumes to avoid the double counting of waste volumes is only applicable to the collocation alternative (new Pu and HEU storage facility). The waste volumes generated from the various storage alternatives and the resultant waste effluent used for the waste impact analysis can be found in Section E.3.1. For the collocation alternative (new Pu and HEU facility), the waste effluent volumes in the impact analysis refer only to wastes from the applicable storage facility, not the net incremental increase/decrease for ORR as a whole. Facilities that would support the storage of Pu and/or HEU would treat and package all waste generated into forms that would enable staging and/or disposal in accordance with RCRA and other applicable statutes. Depending in part on decisions in the ROD for the Waste Management PEIS, wastes could be treated and disposed of onsite or at regionalized or centralized DOE sites. For the purposes of analyses only, this PEIS assumes that TRU and mixed TRU waste would be treated onsite to the current planning-basis WIPP WAC, and shipped to WIPP for disposal. This PEIS also assumes that LLW, mixed LLW, hazardous, and nonhazardous waste would be treated and disposed of in accordance with current site practice.

No Action Alternative

Under this alternative spent nuclear fuel and TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be generated at ORR from the missions outlined in Section 3.6. Under No Action, ORR would continue to store HEU, and treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities.

A small quantity of spent nuclear fuel could be generated by the ORNL High-Flux Isotope Reactor in the production of isotopes for commercial applications and in conducting research. The reactor pool is almost full, but reracking positions for the fuel is under way. This will provide storage space for the spent fuel generated by the reactor until 2000 (OR LMES 1996a:3-3,3-4). Installing modular dry storage units at the site for further storage is being planned (DOE 1995w:3.2-12). Other fuel and irradiated nuclear material is stored in various locations at ORR. In accordance with the ROD (60 FR 28680) from the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE-EIS-0203-F), ORR would ship 46 t (51 tons) of spent nuclear fuel to INEL and SRS.

Small quantities of TRU waste would be generated from isotope production and research activities at ORNL. Most of this waste would be generated in remedial action projects. TRU waste previously buried and stored

Table 4.2.5.10–1. Projected Spent Nuclear Fuel and Waste Management Under No Action (2005) at Oak Ridge Reservation[a]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Spent Fuel	None	None	NA	Pools and storage vaults	57	Ship to INEL or SRS	NA
Transuranic (Solid)							
Contact-handled	115	None	NA	Staged for shipment	1,760	WIPP or alternate facility	NA
Remote-handled	4	None	NA	Staged for shipment	856	WIPP or alternate facility	NA
Low-Level							
Liquid	2,970[b]	Activated sludge, solidification, and incineration	419,000	Stored onsite	3,230	NA	NA
Solid	7,320	Compaction, smelting, and incineration by commercial vendor	30,600	Stored onsite	68,000	Onsite for ORNL only. Onsite and offsite LLW disposal for K–25 and Y–12 under evaluation	3,590 (ORNL only)
Mixed[c]							
Liquid	87,600	Neutralization, incineration, and activated sludge	233,000[d]	Stored in tanks and drums	100,000	NA	NA
Solid	432	Incineration or offsite commercial vendors	Planned	Staged and stored for shipment	132,000	Offsite	NA
Hazardous							
Liquid	6,460[e]	Neutralization, settlement, and offsite	30,300	Stored in tanks and staged for shipment	751	Offsite	NA
Solid	26[f]	Offsite planned and open-burning[g]	Variable	Staged for shipment	300	Offsite	NA

Table 4.2.5.10–1. Projected Spent Nuclear Fuel and Waste Management Under No Action (2005) at Oak Ridge Reservation[a]—Continued

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Nonhazardous (Sanitary)							
Liquid	550,000	Offsite and extended aeration-activation	3,180,000	None	NA	NPDES outfall	NA
Solid	53,100	Compaction	41,700	None	NA	Landfill (Onsite) Landfill (Offsite)	1,100,000
Nonhazardous (Other)							
Liquid	650,000[h]	Evaporation, settling, and neutralization	1,980,000[i]	None	NA	NPDES outfall	NA
Solid	321[h]	None	NA	None-scrap metal stockpiled	NA	Landfill (K–25, Y–12, and SWSA-6)	119,000[j]

[a] The generation rate, treatment, and storage data for the three sites at ORR were combined.
[b] Some waste included in solid LLW.
[c] Includes RCRA, PCB, and RCRA/PCB waste.
[d] Some waste included in LLW.
[e] Some liquid hazardous waste is treated as mixed LLW.
[f] Some solid hazardous waste included in solid mixed LLW.
[g] The Chemical Detonation Facility treats small amounts of hazardous wastes that would be dangerous to transport offsite.
[h] Some nonhazardous waste included in solid LLW.
[i] Some waste is included in sanitary waste.
[j] Some waste is included in sanitary waste and Y–12 solid disposal.

Note: NA=not applicable.
Source: OR LMES 1995e.

Table 4.2.5.10–2. Estimated Annual Generated Waste Volumes at Oak Ridge Reservation—No Action (2005) and Net Incremental for Storage Alternatives

Category	No Action[a] (m^3)	Upgrade[b] (m^3)	Collocation			Phaseout (m^3)
			New Pu Storage Facility Only[b] (m^3)	New Pu Storage Facility and Upgrade Y–12[b] (m^3)	New Pu and HEU Storage Facility[b] (m^3)	
Transuranic						
Liquid	None	0	0.02[c]	0.02[c]	0.02[c]	0
Solid	119	0	10	10	10	0
Mixed Transuranic						
Liquid	None	0	0	0	0	0
Solid	None	0	4	4	4	0
Low-Level						
Liquid	2,970	0.04[c]	2[c]	2[c]	1.7[c]	-0.4
Solid	7,320	3	1,260	1,263	1,300	-1.5
Mixed Low-Level						
Liquid	87,600	0.02	0.2	0.2	-0.2	-0.4
Solid	432	0.8	65	66	66	-0.4
Hazardous						
Liquid	6,460	Included in mixed LLW	2	2	2	Included in mixed LLW
Solid	26	Included in mixed LLW	2	2	2	Included in mixed LLW

Table 4.2.5.10–2. Estimated Annual Generated Waste Volumes at Oak Ridge Reservation—No Action (2005) and Net Incremental for Storage Alternatives—Continued

Category	No Action[a] (m^3)	Upgrade[b] (m^3)	Collocation			Phaseout (m^3)
			New Pu Storage Facility Only[b] (m^3)	New Pu Storage Facility and Upgrade Y–12[b] (m^3)	New Pu and HEU Storage Facility[b] (m^3)	
Nonhazardous (Sanitary)						
Liquid	550,000	0.8	136,630	136,630	171,840	-0.2
Solid	53,100	31	1,340	1,370	1,720	-15
Nonhazardous (Other)						
Liquid	650,000	0.8	Included in sanitary	0.8	-0.4	-0.4
Solid	321	0.8	1,700[d]	1,700[d]	2,200[d]	-0.4

[a] The No Action waste volumes are from Table 4.2.5.10–1.

[b] Waste volumes for storage alternatives are found in Section E.3.1 (Tables E.3.1.1–4, E.3.1.3–6, and E.3.1.3–7). Net incremental volumes for collocation alternative (new Pu and HEU storage facility) were derived by substituting phaseout volumes so as not to double count waste volumes associated with HEU storage. Waste effluents (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in these tables.

[c] Liquid TRU and LLW would be treated and solidified prior to disposal.

[d] Recyclable wastes.

would be repackaged into TRUPACT-II containers for eventual shipment to WIPP. If shipments to WIPP were delayed, plans for additional TRU storage facilities would be incorporated in the design of these facilities.

Liquid LLW would be solidified, neutralized, and allowed to evaporate. Some liquid waste would also be incinerated. Solid LLW would be compacted and stored onsite at K–25 and ORNL. Contaminated scrap metal would be processed for beneficial reuse where possible, including the DOE Shielding Block Program, or be size-reduced for disposal. Hazardous waste would be treated in both onsite and offsite RCRA-permitted facilities. Disposal of hazardous wastes would be provided by offsite facilities licensed to dispose of waste regulated under RCRA.

Mixed waste would be treated and disposed of according to the ORR Site Treatment Plan, which was developed pursuant to the *Federal Facility Compliance Act*. Liquid mixed waste would also be incinerated at the TSCA Incinerator. The resulting waste would then be stored in a RCRA-permitted facility in DOT-approved containers until it is shipped to an offsite DOE disposal facility. Some of this waste would be placed in interim storage until new technologies for treatment and disposal are identified and evaluated.

A new industrial pretreatment facility for liquid discharges from Y–12 to the City of Oak Ridge sanitary system would be constructed under the terms of their Industrial Pretreatment Permit. Nonhazardous sanitary and nonradioactive process waste liquids would be treated in conventional sewage treatment plants. The resultant solids would be disposed of with solid nonhazardous waste in a permitted landfill sized to handle projected future waste volumes.

Upgrade Alternative

Preferred Alternative: Modify Existing Y–12 Plant for Continued Highly Enriched Uranium Storage

Construction and operation of an upgraded HEU storage facility would have a minimal impact on existing ORR waste management activities. Waste generated during construction would consist of solid LLW and nonhazardous waste. The nonhazardous waste would be disposed of as part of the construction project by the contractor. The low-level contaminated concrete would be placed in appropriate containers and shipped to a DOE LLW disposal facility. The low-level contaminated steel would go to the contaminated Scrap Metal Yard, where it would be shipped to an offsite contractor for processing for beneficial reuse where possible, including the DOE Shielding Block Program.

Operation of the upgraded facility presents very little increase in low-level, mixed, hazardous, and nonhazardous waste volumes as compared to the No Action volumes for any waste category. The contribution of this operation to the ORR waste management activities is illustrated in Table 4.2.5.10–2 and could easily be handled by existing waste management facilities.

Collocation Alternative

Construct New Plutonium Storage Facility; Maintain Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Construction and operation of a consolidated Pu storage facility in conjunction with No Action for HEU storage would have an impact on existing ORR waste management activities, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, and solid nonhazardous and hazardous wastes. The nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous waste would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations.

After treatment and volume reduction of TRU waste, approximately 5 m^3 (7 yd^3) of TRU waste and 4 m^3 (5 yd^3) of mixed TRU waste from leaded gloves, windows, and contaminated lead shielding would be treated and packaged to meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment to WIPP (depending on decisions made in the ROD associated with the supplemental EIS for the proposed continued phased development of WIPP for disposal of TRU waste), TRU and mixed TRU wastes would be stored in above-grade storage facilities. One additional truck shipment per year or, if applicable, one regular train shipment every 2 years or one dedicated train shipment every 6 years would be required to transport these wastes to WIPP.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW would require storage/disposal after treatment at ORR. Assuming a land usage of 3,300 m^3/ha (1,700 yd^3/acre), this would require 0.2 ha/yr (0.5 acres/yr) of LLW disposal area. If onsite disposal at ORR is not possible, approximately 38 LLW shipments per year to a DOE disposal facility would be required. The 0.2 m^3 (50 gal) of liquid mixed LLW and 65 m^3 (85 yd^3) of solid mixed LLW would be treated and disposed of in accordance with ORR Site Treatment Plan through the use of existing and planned facilities. The additional 2 m^3 (476 gal) of liquid hazardous waste and 2 m^3 (3 yd^3) of solid hazardous wastes would have minimal impact on waste management activities at ORR, as existing and planned facilities are adequate to store the increase while awaiting shipment to offsite RCRA-permitted facilities. Approximately 136,630 m^3 (36,100,000 gal) of liquid nonhazardous waste may require construction of utility and process wastewater treatment systems. The existing sanitary treatment system would be adequate. After volume reduction, 670 m^3 (876 yd^3) of solid nonhazardous wastes would require disposal at the onsite landfill.

Construct New Plutonium Storage Facility and Modify Existing Highly Enriched Uranium Storage Facilities at Y–12 Plant

Construction and operation of a consolidated Pu storage facility collocated with HEU upgrade would have an impact on existing ORR waste management activities, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. The impacts would be identical to those presented in the previous section.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction and operation of a consolidated Pu storage facility collocated with HEU storage would have an impact on existing ORR waste management activities, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous waste would be shipped to a commercial RCRA-permitted treatment and disposal facility. The sources of wastes are similar to those of the consolidated Pu storage facility with HEU upgrade; however, the quantity with the exception of TRU waste would change. The impacts from TRU waste would be identical to those identified in the two previous options.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW contaminated with Pu and 20 m^3 (26 yd^3) of LLW contaminated with uranium would require treatment and storage/disposal at ORR. Assuming a land usage of 3,300 m^3/ha (1,700 yd^3/acre), this would require 0.2 ha/yr (0.5 acres/yr) of LLW disposal area. If onsite disposal at ORR is not possible, approximately 39 LLW shipments per year to a DOE disposal facility would be required. The 0.2 m^3 (55 gal) of liquid mixed LLW and 66 m^3 (86 yd^3) of solid mixed LLW would be treated and disposed of through the use of existing and planned facilities. The 2 m^3 (528 gal) of liquid hazardous waste and 2 m^3 (3 yd^3) of solid hazardous waste would have minimal impact on waste management activities at ORR, as existing and planned facilities are adequate to store the increase while

awaiting shipment to offsite RCRA-permitted facilities. The 171,840 m^3 (45,400,000 gal) of liquid nonhazardous waste may require construction of utility and process wastewater treatment systems. The existing sanitary treatment system would be adequate. After volume reduction, 870 m^3 (1,140 yd^3) of solid nonhazardous waste would require disposal at the onsite landfill.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve and weapons R&D materials would reduce the amount of operational waste volumes shown in Table 4.2.5.10–2 for the No Action Alternative, the Upgrade Alternative, and the Collocation Alternative. The decrease would be proportional to the amount of material excluded. [Text deleted.]

Phaseout

The phaseout of HEU storage would have little impact on ORR waste management activities. The quantities of waste would decrease by the increments shown in Table 4.2.5.10–2.

4.2.6 SAVANNAH RIVER SITE

A listing of the proposed long-term storage alternatives, subalternatives, and related actions, including the No Action Alternative, at SRS is provided below. The potential impacts of implementing these alternatives and related actions at SRS are described in the following sections: 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, and waste management. The specific long-term storage alternatives proposed for SRS are the Preferred Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative.

Preferred Alternative

Upgrade With RFETS Non-Pit Pu Subalternative:

Modify APSF in F-Area to accommodate RFETS non-pit Pu not including strategic reserve and weapons R&D materials. This subalternative involves a similar but smaller expansion of the APSF compared to the Upgrade with All or Some RFETS Pu or LANL Pu Subalternative.

Proposed Storage Activities at Savannah River Site

- **No Action Alternative:** Continue to store SRS Pu material within the scope of this PEIS in the APSF in F-Area in stabilized form pursuant to DNFSB Recommendation 94-1.
- **Upgrade Alternative:** There are three subalternatives under this storage alternative.
  - ***Upgrade With RFETS Non-Pit Pu Subalternative (Preferred Alternative):*** Modify APSF in F-Area to accommodate RFETS non-pit Pu not including strategic reserve and weapons R&D materials. This subalternative involves a similar but smaller expansion of the APSF compared to the Upgrade with All or Some RFETS Pu or LANL Pu Subalternative.
  - ***Upgrade Without RFETS Pu or LANL Pu Subalternative:*** Since the APSF would be a new facility, the storage subalternative does not apply to SRS.
  - ***Upgrade With All or Some RFETS Pu and LANL Pu Subalternative:*** Modify APSF in F-Area to accommodate SRS, and RFETS and LANL Pu material.
- **Consolidation Alternative:** Construct a new facility east of Z-Area to accommodate all Pu material within the scope of this PEIS.
- **Collocation Alternative:** Construct a new facility east of Z-Area to accommodate all Pu and HEU material within the scope of this PEIS.
- **Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials:** Facility and other resource requirements would be smaller than the No Action Alternative, the Upgrade with All or Some RFETS Pu and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative.
- **Phaseout:** SRS Pu material within the scope of this PEIS would be moved out of F-Area to the Consolidation or Collocation site (located at another DOE site) or to disposition (for surplus Pu).

4.2.6.1 Land Resources

No Action Alternative

Under this alternative, SRS non-pit Pu material would be stored in a new F-Area facility (proposed APSF) in stabilized form. The ongoing (no new action) activities conform with present and future land-use plans, policies, and controls. Therefore, no impacts on land use or visual resources would be anticipated at SRS beyond those of existing and future activities that are independent of the proposed action.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Non-Pit Plutonium Subalternative

Modify Actinide Packaging and Storage Facility for Continued Plutonium Storage

The new APSF in the F-Area would be modified to accommodate SRS non-pit Pu material and RFETS non-pit Pu material. The existing F-Area building and maintenance facilities would support the new facility. The modification would increase the existing footprint of the APSF, however, the facility would be situated entirely within a previously-disturbed protected area. A 1.6-km (1-mi) buffer zone is established for the F-Area.

Land Use. Facility construction and operation would conform with existing and future land use as designated by the current *Savannah River Site Development Plan*. According to the Plan, current F-Area land use is designated industrial operations, while the future land-use category is primary industrial mission. Specifically, the F-Area is one of four SRS waste management areas (SR DOE 1994d:2,11,12). As discussed in Section 4.2.6.8, no in-migration of workers would be required during construction or operation. Therefore, no indirect effects to offsite land use would occur.

Facility modification would not affect other land uses at SRS. There is no prime farmland on SRS. Construction would not be in conflict with land-use plans, policies, and controls of adjacent counties and cities since they do not address SRS. No additional effects to land use would be anticipated from operations.

Visual Resources. Construction and operation affects would be consistent with the industrial landscape character and current VRM Class 5 designation of the F-Area. Due to distance, hilly terrain, and forest cover, visual effects to public access roads with high sensitivity levels (State Highway 125 and SRS Route 1) would not occur.

[Text deleted.]

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Actinide Packaging and Storage Facility for Continued Plutonium Storage

The new APSF in the F-Area would be modified to accommodate SRS, RFETS, and LANL Pu material. The existing F-Area buildings and maintenance facilities would support the new facility. The facility would be situated entirely within a previously disturbed protected area. A 1.6-km (1-mi) buffer zone is established for the F-Area.

Although the increase in existing building footprint would be slightly larger than the Upgrade With RFETS Non-Pit Pu Subalternative, the same overall land area would be required. Therefore, direct and indirect impacts on land resources would be anticipated to be similar.

Consolidation Alternative

Construct New Plutonium Storage Facility

Under this alternative, all Pu within the scope of this PEIS would be stored at a single new storage facility to be constructed at SRS. The proposed facility location is an undisturbed, forested area east of the Z-Area. The consolidated Pu storage plant would disturb 58.5 ha (144 acres) of land area during construction of which 56 ha (138 acres) would be used during operations. A buffer zone would be provided between facilities and the SRS site boundary. Pu storage in existing DOE facilities would be phased out.

Land Use. Facility construction and operation of a new consolidated facility for Pu storage would convert undeveloped, forested land to a developed use. However, the proposed action would conform with the current *Savannah River Site Development Plan*, which designates the future land use of the proposed facility site for the primary industrial mission (SR DOE 1994d:11). [Text deleted.] As discussed in Section 4.2.6.8, no in-migration would occur during construction and only minimal in-migration during operation. Accordingly, there would be minimal impacts to the housing sector. Therefore, no indirect effects on offsite land use would occur.

The facility site would be situated on lands managed by U.S. Forest Service (forest management activities). Since the majority of SRS land area is forested and the forest management program at SRS encompasses a broad range of activities, use of this land area would be anticipated to have an inconsequential effect on the program (SR DOE 1984a:8). Construction and operation would not affect other land uses at SRS. There are no prime farmlands on SRS. Construction and operation would not be in conflict with land-use plans, policies, and controls of adjacent jurisdictions since they do not address SRS.

Visual Resources. The current VRM Class 4 designation of the facility site would be changed to Class 5. Due to distance, hilly terrain, and forest cover, visual effects on public access roads with high sensitivity leve's (State Highway 125 and SRS Route 1) visual effects would not occur. [Text deleted.]

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

All HEU and Pu within the scope of this PEIS would be stored at a primary new storage plant at SRS. The proposed facility location would be east of Z-Area on an undisturbed parcel presently forested. The disturbed area would be 89.5 ha (221 acres) during construction of which 87 ha (215 acres) would be used during operations. A buffer zone would be provided between facilities and the SRS boundary. Pu and HEU storage in existing DOE storage facilities would be phased out. Direct impacts on land resources would be similar to the Consolidation Alternative. As discussed in Section 4.2.6.8, in-migration is anticipated during construction and operation. However, expected vacancies and historic housing construction rates indicate that housing would be available to accommodate the population growth. Therefore, no indirect impacts to offsite lands would occur.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, land effects during construction and operation would be almost the same in extent and magnitude to the No Action Alternative, Upgrade With All or Some RFETS Pu and LANL Pu Subalternative, Consolidation Alternative, and Collocation Alternative because the same facility would be almost the same. However, because the smaller quantity of material would require smaller facilities, it is likely that less land area would be disturbed during construction and used during operations. [Text deleted.]

Phaseout

No new construction or upgrade of existing facilities would occur under phaseout of the Pu storage mission. SRS Pu material would be moved out of the F-Area to a non-SRS consolidation or collocation site or to disposition. Potential impacts on visual resources could occur if facilities are not maintained.

[Text deleted.]

4.2.6.2 Site Infrastructure

The SRS infrastructure would be capable of supporting any of the storage alternatives without major modifications to the existing infrastructure. A comparison of site infrastructure and facilities resource needs for the various storage alternatives is shown in Table 4.2.6.2–1.

No Action Alternative

Savannah River Site would continue to store current inventories of Pu which would be stabilized pursuant to DNSFB Recommendation 94-1 corrective actions. Pu storage would be in the soon to be constructed APSF in the F-Area which DOE decided to build after completing the *Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE/EIS-0220, October 1995). Site infrastructure requirements under No Action could continue to be met with current site capacities and structures. As a result, there would be no impacts on the site infrastructure under No Action.

Upgrade Alternative

Preferred Alternative: Upgrade With Rocky Flats Environmental Technology Site Non-Pit Plutonium Subalternative

Modify Actinide Packaging and Storage Facility for Continued Plutonium Storage

Modification of the APSF to accommodate existing quantities of non-pit Pu material relocated from RFETS would have minimal impact on the site infrastructure. Data for construction are presented in Appendix C. Operations impacts would also be minimal. This subalternative requires an additional amount of coal over that needed for storage of SRS materials without the RFETS Pu and LANL Pu material. This additional requirement would have minimal impact on the site infrastructure.

[Text deleted.]

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Actinide Packaging and Storage Facility for Continued Plutonium Storage

Modification of the APSF to accommodate existing quantities of RFETS and LANL Pu material would have a minimal effect on the site infrastructure. Data for construction are presented in Appendix C. Operational data are summarized in Table 4.2.6.2–1. As shown, site infrastructure resource requirements and associated impacts would be proportionately more than the upgrade with RFETS non-pit Pu materials.

Since impacts associated with relocating all of the RFETS Pu and LANL Pu material to SRS are minimal for both construction and operations, relocating only a portion of this material to SRS would result in minimal impacts to the site infrastructure as well. Additional electrical energy and coal requirements would be proportionately less than that required for storage for the full amount of RFETS Pu and LANL Pu material depending on the actual amount relocated to SRS.

Consolidation Alternative

Construct New Plutonium Storage Facility

Construction of a new consolidated Pu storage facility at SRS would have minimal impact on the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to the SRS infrastructure

Table 4.2.6.2–1. Site Infrastructure Changes Required for Operation at Savannah River Site (Annual)—No Action (2005) and Storage Alternatives

Alternative	Transportation		Electrical		Fuel		
	Roads (km)	Rail-roads (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
No Action							
Site availability	230	103	1,672,000	330	28,390,500	0	221,352
Projected usage	230	103	794,000	116	28,390,500	0	221,352
Upgrade (With RFETS Non-Pit Pu)							
Projected usage with upgrade facility	230	103	797,600	116	28,390,500	0	221,642
Amount required in excess to site availability	0	0	0	0	0	0	290[a]
[Text deleted.]							
Upgrade (With All or Some RFETS Pu and LANL Pu Material)							
Projected usage with upgrade facility	230	103	798,900	116	28,390,500	0	221,752
Amount required in excess to site availability	0	0	0	0	0	0	400[a]
Consolidation							
Projected usage with consolidated facility	235	108	851,000	126	28,436,500	0	225,552
Amount required in excess to site availability	<5	<5	0	0	46,000[b]	0	4,200[a]
Collocation							
Projected usage with collocated facilities	235	108	870,000	129	28,437,500	0	226,152
Amount required in excess to site availability	<5	<5	0	0	47,000[b]	0	4,800[a]
Phaseout							
Projected usage without storage facility	230	103	794,000	116	28,390,500	0	221,352
Amount required in excess to site availability	0	0	0	0	0	0	0

[a] Coal requirements in excess to site availability could be procured through normal contractual means.

[b] Fuel oil requirements in excess to site availability could be procured through normal contractual means.

Source: Modified from SRS 1993a:3; SRS 1996a:4; WSRC 1995e.

under this subalternative would be minimal. As shown in Table 4.2.6.2–1, less than 5 km (3 mi) of roads and less than 5 km (3 mi) of railroad lines would need to be added to the site. Some additional oil and coal would have to be provided as well. Additional oil and coal would be procured through normal contractual means. Electrical infrastructure requirements would be within site capacities.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Constructing new collocated Pu and HEU storage facilities to accommodate long-term storage of Pu and HEU at SRS would have minimal impact on site infrastructure. Data for construction are presented in Appendix C. As shown in Table 4.2.6.2–1, less than 5 km (3 mi) of roads and less than 5 km (3 mi) of railroad lines would need to be added to the site. Operations impacts to the SRS infrastructure under this subalternative would be minimal. As shown in Table 4.2.6.2–1, some additional coal and oil over that required for the consolidation of Pu alternative would be required. As for other alternatives, this additional amount would be procured through normal contractual means.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Since the existing SRS site infrastructure would be capable of supporting construction/modification and operation of facilities for the Upgrade Alternative With All or Some RFETS Pu and LANL Pu, Consolidation Alternative, and Collocation Alternative, constructing and operating such facilities without including provisions for storage of strategic reserve and weapons R&D materials could be accommodated as well. Expected reductions in amounts of annual electrical energy requirements for the various storage facilities are the only site infrastructure changes expected if this subalternative is chosen because electric usage is dependent on the amount of material. [Text deleted.]

Phaseout

This phaseout would have no impact on the site infrastructure. While Pu storage operation would cease, the storage facilities would remain and utility service would continue until D&D is accomplished.