CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4 describes the environmental consequences of the alternatives for the decommissioning and/or long-term stewardship of the Western New York Nuclear Service Center (WNYNSC). A detailed discussion of each alternative is given in Chapter 2. The impact analyses presented in Section 4.1 of this chapter address those areas of the environment where the potential exists for environmental impacts. Section 4.2 addresses cost-benefit considerations, and Section 4.3 discusses incomplete and unavailable information. Intentional destructive acts are described in Section 4.4. The cumulative impacts are presented in Section 4.5. Resource commitments, including unavoidable adverse environmental impacts, the relationship between short-term use of the environment and long-term productivity, and irreversible and irretrievable commitments of resources, are presented in Section 4.6. A summary comparison of the environmental effects among alternatives is presented in Chapter 2, Section 2.6.

This chapter presents the results of the analysis of consequences (impacts) of the alternatives described in Chapter 2 of this environmental impact statement (EIS). The analysis is organized by resource area. Site information for these resource areas is presented in Chapter 3 and provides the basis for the impact analyses.

The level of documentation provided in this EIS for each resource area is consistent with its significance, where significance includes the severity, nature, and extent of environmental impact and the potential for controversy. This approach is consistent with Council on Environmental Quality (CEQ) and U.S. Department of Energy (DOE) National Environmental Policy Act (NEPA) guidance to focus the presentation in an EIS on the impacts of significance.

The results of the impact analysis indicate that the areas of greater significance and therefore more extensive discussion in this chapter are:

- Occupational exposure
- Waste management
- Transportation

Impacts of concern based on comments expressed in various forums and therefore discussed in more detail are:

- Radiological impacts during decommissioning actions
- Long-term radiological impacts of any waste that remains on site as a result of either groundwater release and transport or erosion-driven release

Impacts of less significance and therefore discussed in less detail are:

- Land use and visual resources
- Site infrastructure
- Geology and soils
- Short-term water resources

- Air quality
- Noise
- Ecological resources
- Cultural resources
- Socioeconomics
- Environmental justice

The analysis of potential impacts of EIS alternatives addresses two different groups of site activities: those associated with *decommissioning* site facilities, and those associated with *site monitoring and maintenance* (including site access control), possibly including a *long-term stewardship* program for some alternatives. Decommissioning activities occur over finite periods of time and include construction and eventual disposition of temporary facilities, removal or stabilization of buried radioactive waste, and stabilization of the site against erosion. The impacts of decommissioning are quantified over the period of decommissioning for each decommissioning alternative (see below). For purposes of this EIS, site monitoring and maintenance refers to those activities necessary to ensure protection of human health and the environment before closure of a site, while long-term stewardship refers to those activities (including engineered and institutional controls) necessary to ensure protection of human health and the environment following closure of a site.[1] Impacts from site monitoring and maintenance activities, and stewardship activities as appropriate for some alternatives, are quantified in this EIS on an annual basis.[2] These concepts are summarized for each alternative:

- *Sitewide Removal Alternative* – Decommissioning is assumed to occur over 64 years, during which time site monitoring and maintenance activities would continue. Following decommissioning, the site would be available for unrestricted release to the public, and there would be no need for a long-term stewardship program. There may be a need for a limited amount of site monitoring and maintenance associated with optional temporary onsite storage of orphan waste in the Container Management Facility pending the availability of offsite waste disposal capacity.

- *Sitewide Close-In-Place Alternative* – Decommissioning is assumed to principally occur over 7 years, although the Interim Storage Facility would operate for several more years before being decommissioned. Site monitoring and maintenance activities would continue during decommissioning activities. A long-term stewardship program would be put into place after decommissioning activities are complete that would last in perpetuity (see below).

- *Phased Decisionmaking Alternative* – Phase 1 of this alternative, which is assumed to last up to 30 years, includes a program of decommissioning of some of the waste management areas (WMAs), combined with a program of site study and analyses to enable determination of the additional

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[1] Long-term stewardship includes engineered and institutional controls designed to contain or to prevent exposure to residual contamination and waste such as monitoring and maintenance activities, record-keeping activities, inspections, groundwater monitoring and treatment, access control, posting signs, and periodic performance reviews.

[2] Data for much of the analysis in this chapter is drawn from a series of technical reports addressing each of the alternatives considered in this EIS (WSMS 2008a, 2008b, 2008c, 2008d). Data for the Sitewide Removal Alternative are presented over a 64-year decommissioning period (WSMS 2008a). Data for the Sitewide Close-In-Place and No Action Alternatives are presented over 64-year periods of decommissioning and/or site monitoring and maintenance (WSMS 2008b, 2008d) to facilitate comparisons with data presented for the Sitewide Removal Alternative. Data for the Phased Decommissioning Alternative are presented over the 30-year period considered for Phase 1 of this alternative (WSMS 2008c). (See Chapter 2, Figures 2–6 through 2–9.)

decommissioning or other activities that would occur during Phase 2 of this alternative. Decommissioning during Phase 1 is assumed to principally occur over 8 years, although the Interim Storage Facility would operate for several more years before being decommissioned. Site monitoring and maintenance activities would also continue during and after decommissioning activities until Phase 2 is complete. Following completion of Phase 2, a long-term stewardship program would not be required if the Phase 2 decision is to remove the remaining site WMAs, but would be required if the Phase 2 decision is to close in place the remaining site WMAs.

- *No Action Alternative* – There would be no decommissioning activities under this alternative, although there would be a continued site monitoring and maintenance program that for purposes of analysis is assumed to last in perpetuity (see below).

Because only Phase 1 of the Phased Decisionmaking Alternative is defined, the total impacts for the entire Phased Decisionmaking Alternative are presented as a range considering two situations. The first assumes the Phase 2 actions are removal of the remaining WMAs; so the sitewide end point would be similar to that for the Sitewide Removal Alternative. The second assumes the Phase 2 actions are in-place closure for the remaining WMAs; so the sitewide end point would be a combination of the Sitewide Removal and Close-In-Place Alternatives.

This EIS includes a quantitative analysis of the long-term impacts associated with the Sitewide Close-In-Place and No Action Alternatives, because both alternatives would leave waste and residual contamination on site. The analysis of long-term impacts in this EIS includes for these alternatives an assessment of impacts to individuals and populations assuming continued maintenance of institutional controls and assuming loss of institutional controls after 100 years. Potential long-term impacts associated with the Phased Decisionmaking Alternative are also addressed.

4.1 Analysis of Impacts

4.1.1 Land Use and Visual Resources

Land and visual resources can be impacted by decommissioning actions at WNYNSC. Indicators of land resource impact are land area disturbed during decommissioning and land area available for release for unrestricted use. The analysis of impacts on visual resources was conducted based on changes in visual resource classification using the Bureau of Land Management's Visual Resource Management (VRM) Class system (DOI 1986). VRM Class I provides for very limited management activity, where the level of change to the landscape should be very low and must not attract attention. Under VRM Class II, management activities may be seen, but should not attract the attention of the casual observer, such as solitary small buildings or dirt roads. Management activities under VRM Class III may attract attention, but should not dominate the view of the casual observer. Finally, under VRM Class IV, management activities may dominate the view and become the major focus of viewer attention.

A summary of the impacts of each alternative on land and visual resources is presented in **Table 4–1**.

4.1.1.1 Sitewide Removal Alternative

Land Use

Under the Sitewide Removal Alternative, all site facilities would be removed, soils and sediments would be decontaminated, and all radioactive, hazardous, and mixed low-level radioactive wastes would be shipped off site for disposal when disposal facilities become available. A number of new temporary facilities would be constructed to support removal activities.

Table 4–1 Summary of Land and Visual Resources Impacts

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Land Disturbance (hectares)	An estimated 35.6 hectares of disturbed land would be affected as part of this alternative. Additionally, 16.6 hectares of non-disturbed land would be affected by remediation of the Cesium Prong. Ultimately, all disturbed land (approximately 80 hectares) would be restored to a more natural state. Removal actions would occur over a 64-year period.	An estimated 19.4 hectares of previously disturbed land would be affected as part of this alternative. Additionally, 10.1 hectares of non-disturbed land would be affected by erosion control measures. Not all disturbances would occur at once, but would take place over about 7 years.	An estimated 11.3 hectares of disturbed land would be affected under Phase 1 of this alternative over about 8 years. Under Phase 2 additional disturbance could range from 17.8 to 49.8 hectares.	No additional land would be disturbed as a result of this alternative.
Land Available for Release (hectares)	Following completion of removal actions, the entire WNYNSC (1,352 hectares) would be available for release for unrestricted use, except for any land used for optional orphan waste storage.	Following completion of the in-place closure action and decay of the Cesium Prong and the nonsource area of the North Plateau Groundwater Plume, 1,118 hectares would be available for release for unrestricted use.	Following completion of Phase 1 removal actions, the nonimpacted portion of WNYNSC, estimated to be about 693 hectares, would be available for release for unrestricted use. If the Phase 2 decision results in removal of remaining contamination, the total land available for release under this alternative would be 1,352 hectares; if the decision results in in-place closure, the total available for release would be about 1,118 hectares.	It is estimated that about 693 hectares, would be available for release for unrestricted use.
Visual Resources	The disturbed portion of the site (80.1 hectares) would retain its current VRM Class IV rating during decommissioning activities. The disturbed area would transition to a higher VRM Class II rating following completion of decommissioning activities.	The disturbed portion of the site (80.1 hectares) would maintain its VRM Class IV rating following decommissioning activities. Land released for unrestricted use would retain its VRM Class II rating.	The appearance of the disturbed portion of the site (80.1 hectares) would maintain its VRM Class IV rating during and following completion of Phase 1. Land released for unrestricted use would retain its VRM Class II rating. Following Phase 2, the VRM rating of the site could range from the entire site being rated Class II to most of it being rated Class II, while that portion that is to be retained would be rated Class IV.	No change in the visual character of the site. The disturbed portion of the site would retain its VRM Class IV rating.

WNYNSC = Western New York Nuclear Service Center, VRM = Visual Resource Management.
Note: To convert hectares to acres, multiply by 2.471.

Approximately 11.3 hectares (28 acres) of new temporary facilities and structures would be constructed in areas already in use. Land required for use as laydown areas, excavation for foundations, and other activities conducted in conjunction with construction of the new facilities would result in a total land disturbance of approximately 14.2 hectares (35 acres), all of which would occur within the existing disturbed area.

Additional land disturbance would occur in association with the excavation of the North Plateau Groundwater Plume and Cesium Prong. In total, excavation actions would lead to the disturbance of approximately 35.6 hectares (88 acres) of WNYNSC, including about 19.0 hectares (47 acres) of disturbed land and about

16.6 hectares (41 acres) of the Cesium Prong located outside the disturbed portion of the site. Ultimately, all land within the disturbed portion of the site (approximately 80.1 hectares [198 acres]) would be restored to a more natural state.

Following the removal of buildings and structures, the excavation of waste, and the remediation of the Groundwater Plume and Cesium Prong, all 1,352 hectares (3,340 acres) of WNYNSC would be available for release for unrestricted use. Reuse of this land would be conducted in coordination with State and local planning authorities.

Visual Resources

Construction of new temporary buildings would not change the current VRM Class IV rating of the disturbed portion of the site. Most of the removal activities would take place within the disturbed portion of WNYNSC and would have minimal further negative visual impact. However, actions to remediate areas of the Cesium Prong located outside the disturbed zone, while temporary, would be visible from nearby public vantage points, Route 240, or higher elevations of the site. Upon completion of all decommissioning activities, the site would be graded and revegetated to stabilize exposed soils. At this stage, the WNYNSC Site would no longer appear industrial and would become more consistent with a higher VRM rating (Class II), where the natural landscape would play a more prominent role.

4.1.1.2 Sitewide Close-In-Place Alternative

Land Use

Under the Sitewide Close-In-Place Alternative, approximately 0.4 hectare (1 acre) of new temporary facilities and structures would be constructed in areas already in use. Additional land required for construction laydown and other purposes would result in a total land disturbance of approximately 1.2 hectares (3 acres), all of which would occur within the existing disturbed portion of the site. An additional 17.8 hectares (44 acres) of land would be required for the installation and maintenance of engineered barriers and multi-layer caps in previously disturbed areas. Erosion control measures, including installation of water control structures and work in and adjacent to Quarry, Erdman, and Franks Creeks would impact 10.1 hectares (25 acres) (WSMS 2008b). Overall, as much as 29.1 hectares (72 acres) of WNYNSC land could be disturbed under the Sitewide Close-In-Place Alternative, approximately two-thirds of which would be located within the disturbed portion of the West Valley Demonstration Project (WVDP).

Under the Sitewide Close-In-Place Alternative, a substantial portion of WNYNSC would be made available for reuse without restriction. After completion of the initial implementation actions and decay of the Cesium Prong, more of the site would be available for unrestricted release. However, it is likely that land would need to be retained for access control, for use as a buffer zone around the facilities on the North and South Plateaus, and for maintenance and erosion control around the disturbed areas. Although the exact amount and timing of land releases from WNYNSC under this alternative would be the result of interaction between New York State Energy Research and Development Authority (NYSERDA) and the U.S. Nuclear Regulatory Commission (NRC), the area of the site available for release for unrestricted use is estimated to be about 1,118 hectares (2,762 acres) (see **Figure 4–1**).

Visual Resources

Construction of new temporary buildings at the WNYNSC Site would not change the VRM Class IV rating of the disturbed portion of the site. Following completion of decommissioning activities, the visual character of the disturbed portion of the site would improve; however, it is likely that manmade features (e.g., the North and South Plateau caps would be rock covered) would still dominate much of the view. Thus, the VRM Class IV rating of the area would not change. The Class II rating of the less-developed balance of the site, much of which would be available for release for unrestricted use, would not change.

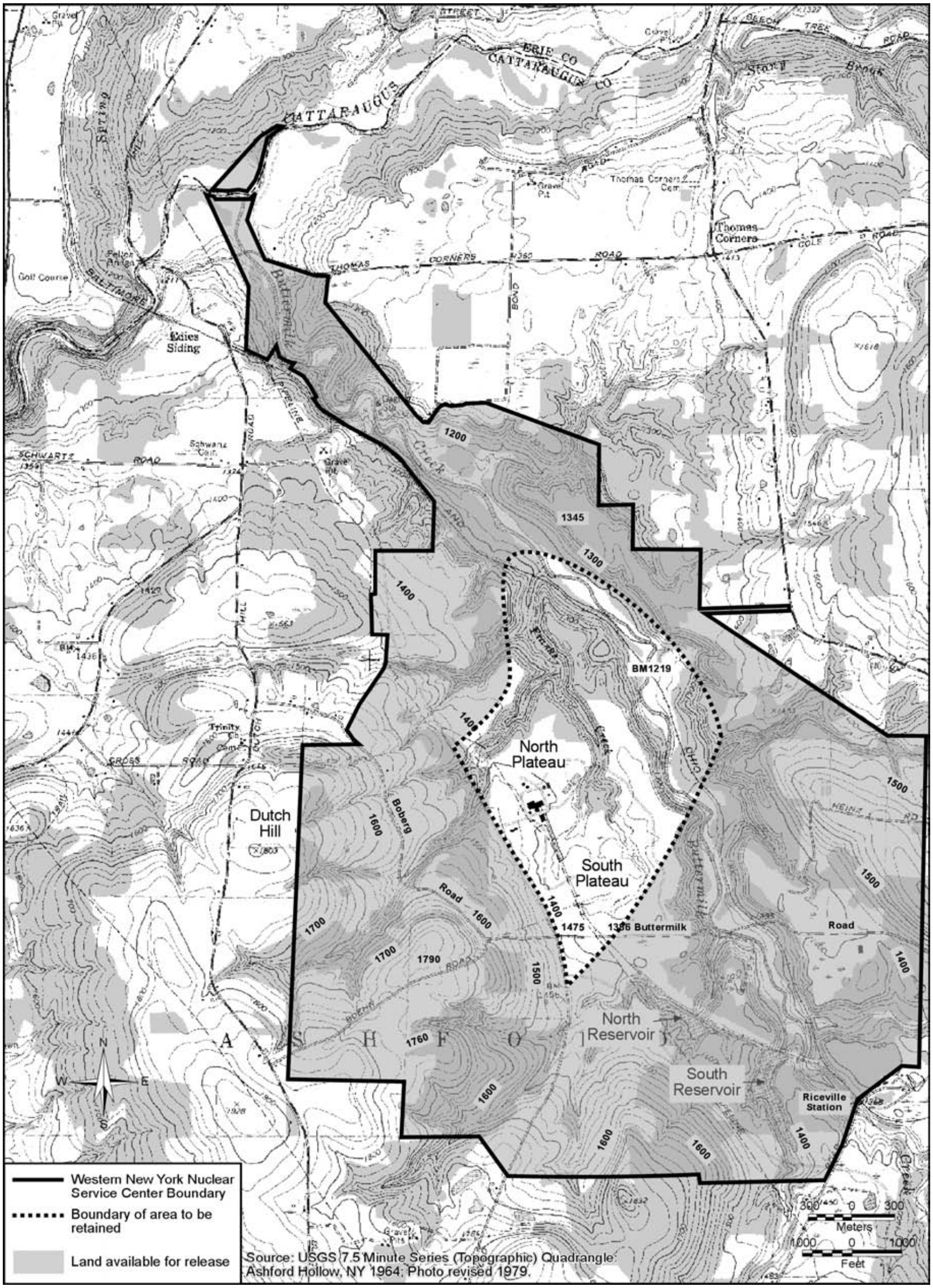

Figure 4–1 Estimate of Portion of the Western New York Nuclear Service Center Land Available for Release for Unrestricted Use After Decommissioning Actions Under the Sitewide Close-In-Place Alternative

4.1.1.3 Phased Decisionmaking Alternative

Land Use

Phase 1 of the Phased Decisionmaking Alternative would result in removal of the Main Plant Process Building and the Low-Level Waste Treatment Facility lagoons. Approximately 0.4 hectare (1 acre) of new temporary facilities and structures would be constructed in areas already in use. Additional land required for construction laydown and other purposes would result in a total land disturbance of approximately 0.8 hectare (2 acres), all of which would occur within the existing disturbed portion of the site.

Additional land disturbance would occur in association with the actual removal of facilities and construction of engineered barriers in previously disturbed areas. These actions would involve approximately 10.5 hectares (26 acres). Overall, approximately 11.3 hectares (28 acres) of WNYNSC could be disturbed under Phase 1 of this alternative. After completion of Phase 1 (and following discussions with regulators), it is estimated that approximately 693 hectares (1,713 acres) of land would be available for release (**Figure 4–2**).

The amount of land impacted by Phase 2 activities, as well as the acreage potentially available for release following decommissioning, would depend on the specific approach taken. Thus, during Phase 2, additional land to be disturbed could range from 17.8 hectares (44 acres) to 49.8 hectares (95.1 acres), depending on whether decommissioning activities reflect those of the Sitewide Close-In-Place Alternative or the Sitewide Removal Alternative. With regard to the amount of land potentially available for release, if future actions reflect those of the Sitewide Removal Alternative, the remaining 658 hectares (1,627 acres) of the site could be available. If decommissioning activities more closely reflect those of the Sitewide Close-In-Place Alternative, it is estimated that an additional 425 hectares (1,049 acres) beyond that released during Phase 1 could be available. Consistent with the Sitewide Close-In-Place Alternative, 234 hectares (578 acres) would be retained indefinitely if Phase 2 was in-place closure for those WMAs not removed as part of Phase 1 (see Section 4.1.1.2 of this chapter).

Visual Resources

Removal of all North Plateau facilities, except the Waste Tank Farm and its supporting facilities, under Phase 1 of the Phased Decisionmaking Alternative, would result in a somewhat improved appearance for that portion of the site. However, due to the overall disturbed appearance of the area, its VRM Class IV rating would not change. The Class II rating of the less-developed balance of the site would not change.

Following Phase 2, the visual character of the site would depend on the actions taken during that phase. The appearance of the site would be consistent with a VRM Class II rating if decommissioning activities followed those of the Sitewide Removal Alternative. If they more closely reflected those of the Sitewide Close-In-Place Alternative, only those portions of the site to be released would have a more natural visual appearance consistent with a VRM Class II rating. The visual character of areas to be retained would be improved to some extent as a result of implementation actions, but would still present a disturbed appearance consistent with a VRM Class IV rating.

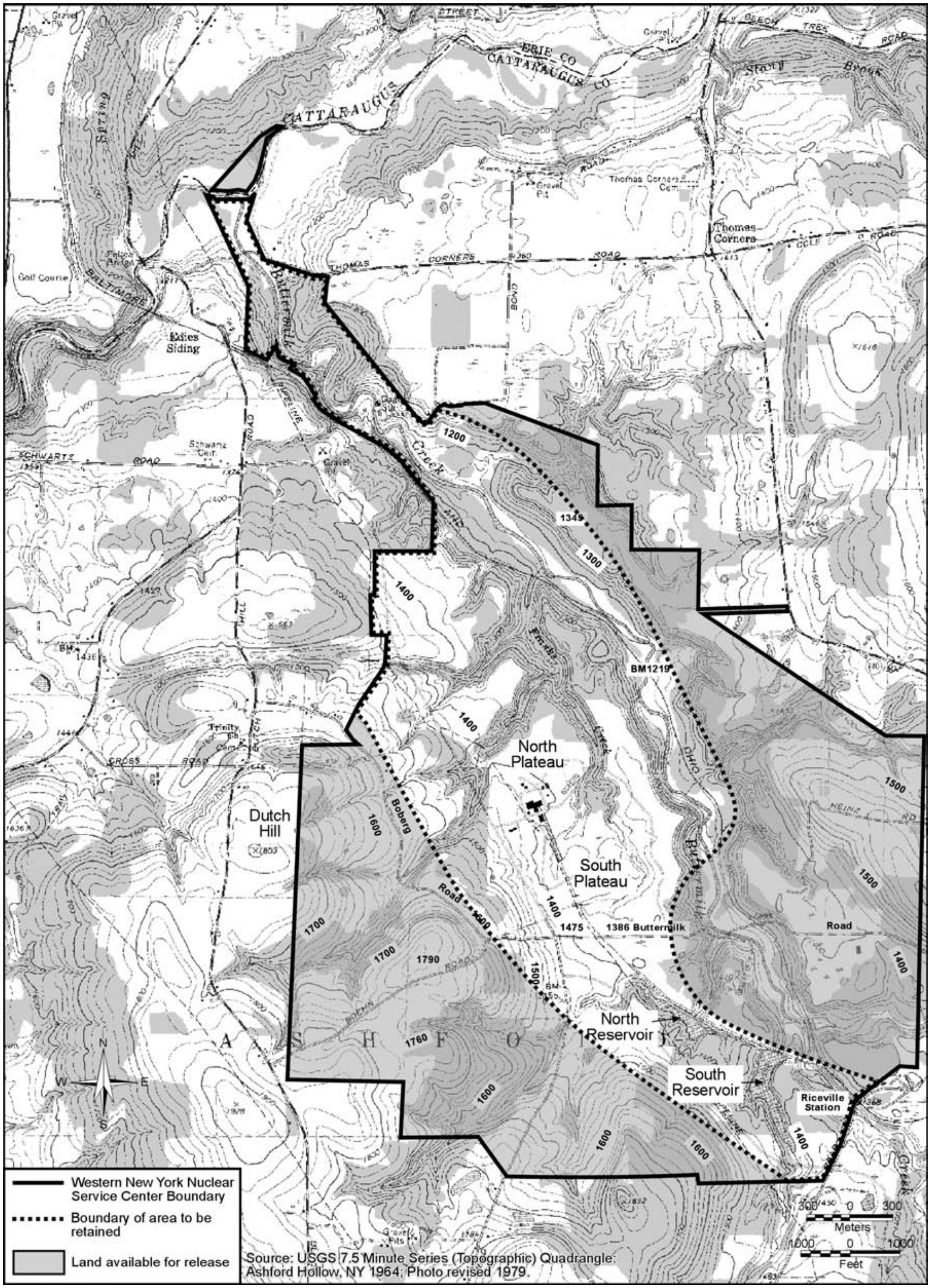

Figure 4–2 Estimate of Nonimpacted Portion of the Western New York Nuclear Service Center Land Available for Release for Unrestricted Use Under the Phased Decisionmaking (Phase 1) and No Action Alternatives

4.1.1.4 No Action Alternative

Land Use

The No Action Alternative would involve continued management and oversight of WNYNSC. No decommissioning decisions would be made, nor decommissioning actions taken. As such, no additional land would be required for construction of new facilities. However, under this alternative, it is estimated that it would be possible to release 693 hectares (1,713 acres) of land not needed for continued management and oversight (see Figure 4–2).

Visual Resources

Implementation of the No Action Alternative would not involve any new construction that would further impact the visual landscape of WNYNSC. Accordingly, the appearance of disturbed and undisturbed portions of the site from nearby public vantage points, Route 240, or higher elevations of the site would remain unchanged. Thus, the VRM Class IV and Class II ratings of the disturbed and undisturbed portions of the site would remain unchanged.

4.1.2 Site Infrastructure

For all alternatives considered in this EIS, the levels of utility use would be well within existing site capacities. Traffic volumes on local roads affected by the activities addressed in any of the alternatives in this EIS are expected to be comparable to or smaller than traffic volumes associated with WNYNSC activities in recent years. A summary of the impacts of each EIS alternative on infrastructure is presented in **Table 4–2.**

Site infrastructure includes the utility systems required to support construction, operation, decommissioning, removal, or stabilization of facilities. It includes electric power and electrical load capacities, natural gas and liquid fuel (i.e., fuel oil, diesel fuel, and gasoline) capacities, and water supply system capacity. Site infrastructure also includes local road networks such as those shown in Chapter 3, Figure 3–3, that could be affected by traffic congestion linked to WNYNSC activities. Physical and radiological risks from possible traffic accidents involving waste shipment and material delivery vehicles are addressed in Section 4.1.12, Transportation, of this chapter.

Table 4–3 provides comparisons of the impacts of each alternative on utility resource use. Electrical power and natural gas uses are presented for the peak years of utility use, and are compared against site capacities for these resources. Peak potable water use is also presented, but the comparison against site capacity is presented for the more conservative total water use rather than potable water use. Total water use is the sum of the projected use of potable, non potable, and augmentation water. Table 4–3 also presents, for each alternative, the total electrical power, natural gas, and potable water use for the entire decommissioning effort, the annual averages for these resources during the periods when decommissioning principally takes place, and the annual averages for these resources for the post-decommissioning monitoring and maintenance periods.

Liquid fuel use is not summarized in Table 4–3 because it is not considered a limiting resource in that supplies can be replenished as needed from offsite sources. Similarly, sanitary sewage would not impact site treatment capacity because peak employment levels for all alternatives are expected to be comparable to or smaller than employment levels in recent years.

Table 4–2 Summary of Infrastructure Impacts

Infrastructure	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Utility requirements: electrical power, natural gas, and water	The largest utility resource use for decommissioning among all alternatives. Peak utility use would represent 11 to 22 percent of the capacity of existing systems.	Smaller utility resource use for decommissioning compared to the Sitewide Removal Alternative. Peak utility use would represent 11 to 17 percent of the capacity of existing systems.	Phase 1 of this alternative would have larger utility resource use for decommissioning than the Sitewide Close-In-Place Alternative. Peak utility use would represent 8.4 to 14 percent of the capacity of existing systems. Including Phase 2, the total utility use for decommissioning under this alternative could range up to that for the Sitewide Removal Alternative.	No decommissioning takes place for this alternative. Peak utility use would represent 1.1 to 2.3 percent of the capacity of existing systems.
Traffic volume	Second largest number of peak daily vehicle trips to and from the site. Elevated traffic volumes would occur over the 64-year period of decommissioning, and would represent about 4.5 times the average daily traffic volume of the No Action Alternative.	Largest number of peak daily vehicle trips to and from the site, including about 6.3 times the peak daily number of trucks as the Sitewide Removal Alternative. Elevated traffic volumes would occur over 7 rather than 64 years. Represents about 6.5 times the average daily traffic volume of the No Action Alternative; but, because traffic volumes are likely to be comparable to those in recent years, road capacity would likely not be exceeded.	Phase 1 of this alternative would have fewer peak daily vehicle trips to and from the site than the Sitewide Removal and Sitewide Close-In-Place Alternatives. Fewer peak daily truck trips than the Sitewide Removal Alternative. Elevated traffic volumes would occur for 8 rather than 64 years. Represents about 4.1 times the average daily traffic volume of the No Action Alternative. For Phase 2, the peak daily traffic volume is expected to range up to that of the Sitewide Close-In-Place Alternative. Elevated traffic volumes would occur over a period of time ranging from a few to several years, depending on the decisions made for Phase 2.	Less than one-quarter the number of total peak daily vehicle trips of other alternatives. Traffic volume would be comprised almost totally of personnel vehicles.

Utility use varies by alternative, depending on the intensity of the decommissioning activities proposed for each alternative. None of the alternatives would use utility resources in annual quantities exceeding about 22 percent of available site capacities. Care is needed, however, in comparing utility resource use across the alternatives. Utility resource use for the Phased Decisionmaking Alternative reflects Phase 1 activities, and additional utility resource use would be associated with Phase 2 activities as they are defined in the future (see Table 4–60). As an upper bound, however, the total utility resource for the entire Phase Decisionmaking Alternative (Phase 1 plus Phase 2) could range up to that for the Sitewide Removal Alternative. Also note that utility resource use would essentially end after completion of decommissioning activities for the Sitewide Removal Alternative, except for utilities used during optional operation of the Container Management Facility for orphan waste storage, but would continue indefinitely into the future for the Sitewide Close-In-Place Alternative after completion of decommissioning activities. Utility use would also continue indefinitely into the future for the No Action Alternative.

Table 4–3 Utility Use and Upper-bound Traffic Volumes for Each Alternative

Indicator	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase 1)	No Action Alternative
Electricity (megawatt-hours)				
Peak electricity use (percent of site capacity) [a]	17,000 (17)	18,000 (17)	14,000 (14)	1,900 (1.8) [b]
Total electricity use during decommissioning [c]	740,000	99,000	86,000	– [d]
Annual electricity use after decommissioning [e]	2,300	980	1,200	1,300 [d]
Natural Gas (cubic meters)				
Peak natural gas use (percent of site capacity) [a]	6,000,000 (22)	2,900,000 (11)	2,300,000 (8.4)	300,000 (1.1) [b]
Total natural gas use during decommissioning [c]	120,000,000	16,000,000	14,000,000	– [d]
Annual natural gas use after decommissioning [e]	360,000	160,000	190,000	190,000 [d]
Water (liters)				
Peak potable water use (percent of site capacity is for total water use) [a, f]	16,000,000 (11)	16,000,000 (11)	11,000,000 (8.5)	4,300,000 (2.3) [b]
Total potable water use during decommissioning [c]	690,000,000	89,000,000	63,000,000	– [d]
Annual potable water use after decommissioning [e]	810,000	1,100,000	300,000	3,100,000 [d]
Traffic Volume (upper-bound number of vehicles per day) [g]				
Trucks	45	280	37	Negligible [j]
Waste shipments	14	3	15	Negligible [j]
Material deliveries	31	280	23	Negligible [j]
Personnel vehicles [h]	620	700	580	150
Total [I]	670 (6.9 - 8.5)	980 (11 - 14)	620 (6.2 - 7.7)	150 [j]

[a] The value is the peak annual utility resource demand for all activities, with the percent of site capacity in parentheses.
[b] Peak activities for the No Action Alternative occur at intervals of about 20 to 25 years.
[c] For the Sitewide Removal Alternative, total utility use is for all activities over 64 years; for the Sitewide Close-In-Place Alternative, total utility use is over 7 years, plus operation and decommissioning of the Interim Storage Facility; for Phase 1 of the Phased Decisionmaking Alternative, total utility use is over 8 years, plus operation and decommissioning of the Interim Storage Facility.
[d] Decommissioning does not occur for the No Action Alternative. Annual average utility resource use is determined by averaging use over 64 years of projected annual site monitoring and maintenance, including periodic activities such as roof replacement, as analyzed in the No Action Alternative technical report (WSMS 2008d).
[e] For the Sitewide Removal Alternative, the value reflects the optional continued operation of the Container Management Facility. For the Sitewide Close-In-Place Alternative, the average was determined over 57 years of projected site monitoring and maintenance, not including operation and decommissioning of the Interim Storage Facility. For the Phased Decisionmaking Alternative (Phase 1), the average was determined over 22 years of projected site monitoring and maintenance, not including operation and decommissioning of the Interim Storage Facility. The averages include periodic activities such as replacement of permeable reactive barrier media.
[f] Total water is the sum of potable water, non potable water, and augmentation water.
[g] Upper-bound daily traffic volumes were estimated by averaging construction delivery and waste shipment traffic over the years when waste shipments and construction material deliveries would principally occur (see footnote h), and estimating personnel vehicles for peak employment years. The volumes reflect daily traffic to and from the site.
[h] Waste shipments and construction material deliveries would principally occur over periods of 64, 7, and 8 years, respectively, for the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives. Peak two-way daily personnel traffic levels during these years are listed in the table. Average two-way daily personnel vehicle traffic levels during these years are respectively about 520, 600, and 460 trips.
[i] The values in parentheses represent the percent increase in total peak daily traffic on U.S. Route 219 compared to the average daily No Action Alternative traffic level, assuming all traffic to and from WNYNSC uses U.S. Route 219.
[j] For the No Action Alternative, there would be an average of about 32 waste shipments per year, or an average of 1 waste shipment roughly every 8 working days, and few deliveries of construction materials.

Notes: Totals may not add because of rounding. To convert from cubic meters to cubic feet, multiply by 35.314; from liters to gallons, by 0.26418.

Sources: WSMS 2008a, 2008b, 2008c, 2008d.

For all alternatives, as remaining utility connections and system components are shut down as decommissioning activities progress, utility resources could be provided by different means. Electrical power could be supplied by temporary service connections and by portable diesel-fired generators. Potable water could be trucked to the point of use. Portable sanitary facilities could be used by decommissioning personnel, which would constitute a relatively small percentage of the total water demand.

Table 4–3 also presents upper-bound daily traffic volumes to and from WNYNSC in terms of trucks (waste shipments from WNYNSC to offsite facilities and deliveries of construction and other materials to WNYNSC) and WNYNSC personnel vehicles. All shipments and deliveries were conservatively assumed to be by truck. Traffic volumes were estimated considering traffic both to and from WNYNSC (each vehicle entering WNYNSC was assumed to leave the same day). Personnel vehicle traffic volumes are listed for peak years of projected direct employment assuming one vehicle (car) per worker.[3] The percent increases in peak truck and total vehicle daily traffic volumes over those projected for the No Action Alternative are presented assuming all traffic to and from WNYNSC is routed through U.S. Route 219.

The Sitewide Close-In-Place Alternative would have the largest impact on roads providing access to WNYNSC. As shown in Table 4–3, the upper-bound daily traffic volume for the Sitewide Close-In-Place Alternative would be about 980 vehicles, as opposed to about 670 vehicles for the Sitewide Removal Alternative and 620 vehicles for Phase 1 of the Phased Decisionmaking Alternative. Almost all of the truck traffic for the Sitewide Close-In-Place Alternative would be due to deliveries of construction and other material. The truck traffic would be spread over 7 years for the Sitewide Close-In-Place Alternative, but would occur over 64 years for the Sitewide Removal Alternative. Peak personnel vehicle traffic volumes would be somewhat larger for the Sitewide Close-In-Place Alternative than for the Sitewide Removal Alternative; however, peak personnel vehicle traffic would occur for only a few years for the Sitewide Close-In-Place Alternative, but would continue for the Sitewide Removal Alternative at levels somewhat smaller than the peak for a longer period of time. The Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives would each result in more than four times the average daily traffic as the No Action Alternative.

The upper-bound daily traffic for Phase 2 of the Phase Decisionmaking Alternative would depend on the scope of activities for Phase 2, which will be determined in the future. If the scope of activities emphasizes removal of remaining facilities such as the State-licensed Disposal Area (SDA) or NRC-licensed Disposal Area (NDA), then the upper-bound daily traffic volume would be comparable to that for the Sitewide Removal Alternative; while if the scope of activities emphasizes capping these facilities in place, then the upper-bound daily traffic volume would be comparable to that for the Sitewide Close-In-Place Alternative. Regarding the second option, much of the daily traffic would consist of trucks making deliveries of construction and other materials.

Chapter 3, Section 3.2.5, of this EIS discusses and illustrates (Figure 3–3) the existing road networks near WNYNSC, including U.S. Route 219, which is a major arterial highway in the area and currently operates at Level of Service D near WNYNSC. Conservatively assuming all traffic to and from WNYNSC uses U.S. Route 219,[4] the peak daily traffic level associated with the Sitewide Removal Alternative would be about 6.9 to 8.5 percent larger on U.S. Route 219 than the average traffic volume associated with the No Action Alternative. A somewhat smaller increase is projected for Phase 1 of the Phased Decisionmaking Alternative. A larger increase (11 to 14 percent) is projected for the Sitewide Close-In-Place Alternative. The projected increase for the Sitewide Removal Alternative, however, would last for about 64 years, while the projected

[3] Although some workers may share rides with other workers, leading to fewer vehicles entering WNYNSC than the number of workers, some workers may also temporarily leave the site, to return the same day.
[4] A 2006 Environmental Assessment for WVDP estimated a daily total traffic volume of 6,100 to 7,500 vehicles along U.S. Route 219 between its intersection with New York Route 39 in Springville and the intersection with Cattaraugus County Route 12 (East Otto Road), of which approximately 18 percent (1,100 to 1,350 vehicles) was truck traffic (DOE 2006c).

increase for the Sitewide Close-In-Place Alternative would last for about 7 years, and the projected increase for Phase 1 of the Phased Decisionmaking Alternative would last for about 8 years.

Phase 2 of the Decisionmaking Alternative could result in increased traffic on U.S. Route 219 that could range up to that for the Sitewide Close-In-Place Alternative, assuming that the scope of activities for Phase 2 emphasizes in-place closure of facilities such as the SDA or NDA. This increased traffic, however, would be over a relatively short period of time, compared to that required for removing these facilities. In the latter case, the increase in daily traffic on U.S. Route 219 would be smaller (i.e., more comparable to that for the Sitewide Removal Alternative), but would last for a longer period of time.

For any of the alternatives, however, traffic volumes should be comparable to or smaller than those associated with WVDP activities in recent years. Site employment at WNYNSC was 1,054 workers in 1993 (DOE 1996a), about 500 in 2003 (DOE 2003e), and 388 in August 2006 (see Chapter 3, Section 3.10.1). Conservatively discounting daily truck shipments and using the same assumptions for employee vehicles as those for the alternatives in this EIS, the daily traffic levels would have been about 2,100 in 1993, 1,000 in 2003, and 780 in 2006. The projected upper-bound daily traffic level for the Sitewide Close-In-Place Alternative (980 vehicles), which is the projected largest of any of the alternatives, would be about half the assumed 1993 traffic level, about equal to the 2003 traffic level, and 26 percent larger than the 2006 level.

Although implementing any alternative would likely not cause traffic levels to exceed those routinely experienced in the recent past, if large enough to be of concern, traffic levels on roads such as U.S. Route 219 could be mitigated as addressed in Chapter 6, Section 6.10, of this EIS. Truck deliveries to the site or truck shipments off site could be timed to avoid peak traffic volume hours when work shifts change. Roads could be improved to increase the capacity of traffic entering or exiting the site, or realigned to reduce points of congestion, turning lanes could be created to for entering and exiting the WNYNSC Site, or traffic signals could be installed at important intersections. Employee programs and incentives for ridesharing could be implemented, as could employee programs that provide flexible hours or staggered work shifts. Shipment or delivery of some wastes or materials by rail would also mitigate traffic congestion.

When constructed, the planned extension of the U.S. Route 219 freeway from its current terminus at Route 39 in Springville, New York (a few miles north of WNYNSC), to Interstate 86 near Salamanca, New York, should also mitigate any local traffic pressures. The freeway extension will parallel existing U.S. Route 219, which will be retained (USDOT and NYSDOT 2003b). Completion of the entire 45-kilometer (28-mile) extent of the freeway is expected in winter 2014/2015 (NYSDOT 2008b).

It is not expected that traffic volumes in the two-county Region of Influence (ROI) would be significantly affected by implementing any of the alternatives. Projected direct and indirect employment levels (see Section 4.1.8 of this chapter) can be used as an indicator for likely regional traffic volumes. The average direct and indirect employment levels for the decommissioning periods for the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives would be roughly 3 to 4 times as large as the average for the No Action Alternative (about 155 direct and indirect), and these increased employment levels would last longer for the Sitewide Removal Alternative than for the Sitewide Close-In-Place and Phased Decisionmaking Alternatives. Nonetheless, the levels for any alternative would represent only a tiny fraction of the population in the ROI, which was about 1 million persons in 2006.[5] The average levels for the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternative decommissioning periods would respectively represent about 0.05, 0.06, and 0.05 percent of the 2006 population. Finally, the largest average direct and indirect employment level for any of the alternatives

[5] *From Chapter 3, Section 3.10.2, the population in the ROI declined from 1,034,220 in 2000 to 1,002,924 in 2006. The largest projected average direct and indirect employment level for any of the alternatives (620 persons) would represent only about 2 percent of this population decline.*

(620 for the Sitewide Close-In-Place Alternative) would be still smaller than the WNYNSC employment level as recently as 2006 (about 800 direct and indirect). Therefore, the impact on regional traffic volumes for any of the alternatives is expected to be small.[6] This conclusion is expected to be the same considering the upper-bound employment levels that could be required for Phase 2 of the Phased Decommissioning Alternative.

4.1.2.1 Sitewide Removal Alternative

Implementing this alternative would enable the release of all WMAs for unrestricted use. Several new facilities would be constructed, operated, and ultimately closed in support of removal actions, requiring use of utility resources.

During decommissioning, removal of WMA 8, the SDA, would have the largest demand of any activity for electricity, natural gas, and potable water. This is partly a reflection of the relatively long period of time over which WMA 8 removal would take place and the intensity of the removal activities required, including heavy equipment use and the construction, operation, and eventual demolition of environmental enclosures. Annual utility resource requirements for WMA 8 removal would range from 2,700 to 9,000 megawatt-hours of electrical power, 430,000 to 1,400,000 cubic meters (15 million to 51 million cubic feet) of natural gas, and 2.3 million to 7.8 million liters (610,000 to 2.1 million gallons) of potable water.

Considering all activities, electrical power and natural gas use would peak in years 24 and 1, respectively. Potable water use would peak in year 24. Peak annual electricity, natural gas, and total water use would be about 17 percent, 22 percent, and 11 percent, respectively, of the capacity of WNYNSC utility systems.

Following completion of decommissioning activities, there could be some annual utility resource use associated with optional onsite storage of orphan waste. To estimate utility resource use in this event, it was assumed that operation of the Container Management Facility would continue to operate following completion of removal activities. Annual electrical power, natural gas, and potable water requirements for Container Management Facility operation would be, respectively, 2,300 megawatt-hours, 360,000 cubic meters (13 million cubic feet), and 810,000 liters (220,000 gallons) (WSMS 2008a).

Shipments of waste and deliveries of construction materials for this alternative would generally occur throughout the life of the 64-year decommissioning period. The average daily two-way truck traffic over 64 years would be about 45 trips, representing 3.3 to 4.1 percent of the truck traffic reported on U.S. Route 219 in the 2006 *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project* (DOE 2006c). The two-way daily personnel vehicle traffic would peak at about 620 trips in year 11, would experience a low of 96 trips in year 64, and would average about 520 trips over the 64-year decommissioning period.

The combined daily two-way truck and personnel vehicle trips would peak at about 670 trips. Assuming all truck and personnel traffic to and from WNYNSC would be routed through U.S. Route 219, daily traffic on U.S. Route 219 would increase by 6.9 to 8.5 percent compared to the minimum daily traffic associated with the No Action Alternative.

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[6] Also see the conclusion of Section 4.1.8, Socioeconomics, of this chapter. None of the alternatives would have any appreciable impact on the demographic characteristics of the WNYNSC region. It is expected that the in-migration of workers, if any, to support closure or long-term management operations at WNYNSC under any of the alternatives would be small. This lack of worker in-migration supports the conclusion that regional traffic volumes would not be significantly affected by implementing the alternatives addressed in this EIS.

4.1.2.2 Sitewide Close-In-Place Alternative

This alternative would have reduced utility resource requirements compared to the Sitewide Removal Alternative. Decommissioning would be largely completed in about 7 years, although the Interim Storage Facility would operate until year 32, and would be decommissioned in year 33. Long-term stewardship would ensue after decommissioning is complete and would last indefinitely into the future and include site monitoring and maintenance.

For 5 of the 7 years that decommissioning would principally take place, the largest utility resource use would be associated with WMA 8 closure. Annual electrical power, natural gas, and potable water requirements for WMA 8 closure would be 5,100 megawatt-hours, 810,000 cubic meters (29 million cubic feet), and 4.4 million liters (1.2 million gallons), respectively. Annual operation of the Interim Storage Facility is projected to require about 140 megawatt-hours of electricity, 22,000 cubic meters (790,000 cubic feet) of natural gas, and 120,000 liters (32,000 gallons) of potable water. Decommissioning of the Interim Storage Facility is projected to require 1,700 megawatt-hours of electricity, 270,000 cubic meters (9.4 million cubic feet) of natural gas, and 1.4 million liters (380,000 gallons) of potable water.

For all three utility resources, peak annual demands are projected to occur in year 6. Peak annual electricity, natural gas, and total water use would be about 17 percent, 11 percent, and 11 percent, respectively, of the capacity of WNYNSC utility systems. There would be no impact on site sanitary sewage treatment capacity because although peak direct employment levels are the largest of any alternative in this EIS, they are smaller than site employment levels in the recent past.

Following the 7-year principal decommissioning period, annual utility requirements would be for site security, site environmental monitoring, and maintenance of erosion controls and the caps for WMA 7, WMA 8, and the North Plateau Groundwater Plume. These annual activities are projected to require about 970 megawatt-hours of electricity, 150,000 cubic meters (5.4 million cubic feet) of natural gas, and 1.1 million liters (280,000 gallons) of potable water. In addition, on about a 20-year interval, utilities would be required to replace media for the North Plateau Groundwater Plume permeable reactive barrier. These periodic requirements would include about 240 megawatt-hours of electricity, 37,000 cubic meters (1.3 million cubic feet) of natural gas, and 200,000 liters (54,000 gallons) of potable water.

Almost all of the waste shipments and construction material deliveries for this alternative would occur over the first 7 years of the implementation period when most decommissioning would take place, and reflect the need for large quantities of soil, sand, gravel, and other materials for NDA and SDA stabilization. The average daily two-way truck traffic would be about 280 trips, almost all of which would be due to deliveries of construction materials, and representing 21 to 26 percent of the truck traffic reported on U.S. Route 219 in the 2006 Environmental Assessment (EA) (DOE 2006c). The two-way daily personnel vehicle traffic would peak at about 700 trips in year 3, would experience a low of 36 trips in year 34, and would average about 600 trips over the 7-year decommissioning period.

The combined daily two-way truck and personnel vehicle trips would peak at about 980 trips. Assuming all traffic to and from WNYNSC would be routed through U.S. Route 219, the total daily traffic flow on U.S. Route 219 would increase by 11 to 14 percent compared to the minimum daily traffic associated with the No Action Alternative. Peak daily truck traffic would be about 6.3 times greater than that estimated for the Sitewide Removal Alternative. Traffic volumes for all vehicles would be about 46 percent larger than those for the Sitewide Removal Alternative and would last for a far shorter time period. Impacts could be mitigated, if needed, by administrative controls such as those discussed earlier.

4.1.2.3 Phased Decisionmaking Alternative

Decommissioning under Phase 1 of this alternative is projected to principally occur over 8 years. Thereafter, the Interim Storage Facility would be operated until year 29 and decommissioned in year 30.

During the first 8 years, decommissioning of WMA 1, the Main Plant Process Building, would have the largest requirements for electrical power and natural gas. Over 8 years, annual electrical power use for this activity would range from 3,200 to 8,700 megawatt-hours; annual natural gas use would range from 510,000 to 1.4 million cubic meters (18 million to 49 million cubic feet); and annual potable water use would range from 2.8 million to 7.5 million liters (740,000 to 2.0 million gallons). Annual operation of the Interim Storage Facility would require about 100 megawatt-hours of electricity, 17,000 cubic meters (580,000 cubic feet) of natural gas, and 21,000 liters (5,700 gallons) of potable water. Decommissioning of the Interim Storage Facility would require about 2,000 megawatt-hours of electricity, 320,000 cubic meters (11 million cubic feet) of natural gas, and 1.7 million liters (450,000 gallons) of potable water.

Peak utility resource use during closure, considering all activities, would be concentrated in year 6. Peak annual electricity, natural gas, and total water use would be about 14 percent, 8.4 percent, and 8.5 percent, respectively, of the capacity of WNYNSC utility systems.

Following the 8-year principal decommissioning period, utilities would be annually used for site security, site environmental monitoring, and site maintenance including maintenance of WMA 3 (Waste Tank Farm Area), WMA 7, and WMA 8. Annual requirements for site security and environmental monitoring and maintenance would include about 1,100 megawatt-hours of electricity, 180,000 cubic meters (6.5 million cubic feet) of natural gas, and 240,000 liters (63,000 gallons) of potable water. Utilities may also be required for as needed replacement of geomembranes covering WMA 7 and WMA 8, and for replacement of media for the North Plateau Groundwater Plume permeable reactive barrier. Replacement of both WMA 7 and WMA 8 geomembranes would require about 1.7 million liters (450,000 gallons) of potable water per replacement activity. Replacement of media for the permeable reactive barrier would require about 230 megawatt-hours of electricity, 37,000 cubic meters (1.3 million cubic feet) of natural gas, and 110,000 liters (28,000 gallons) of potable water.

Utility use for Phase 2 of this alternative would depend on future decisions. As a first approximation, the total and peak utility use for decommissioning under the Phased Decisionmaking Alternative (Phase 1 plus Phase 2) could range up to that for the Sitewide Removal Alternative. Following decommissioning, the annual use of utilities would depend on the need to maintain any contamination left in place and on the optional need for operation of a facility such as the Interim Storage Facility for orphan waste.

Most waste shipments and construction material deliveries for Phase 1 of this alternative would occur over an 8-year period when decommissioning principally takes place. Assuming all waste shipments and construction material deliveries occur during these 8 years, the two-way daily truck traffic would be about 37 trips, representing about 2.8 to 3.4 percent of the truck traffic reported on U.S. Route 219 in the 2006 EA (DOE 2006c). The two-way daily personnel vehicle traffic would peak at about 580 trips in year 4, would experience a low of 100 trips in year 9, and would average about 460 trips over the 8-year decommissioning period.

The combined daily two-way truck and car traffic volume would peak at about 620 vehicle trips. Assuming all traffic to and from WNYNSC would be routed through U.S. Route 219, the total daily traffic flow on U.S. Route 219 would increase by 6.2 to 7.7 percent compared to the average daily traffic associated with the No Action Alternative. These impacts would be somewhat smaller than those for the Sitewide Removal Alternative, and would occur for a far shorter time period. Additional impacts could occur from implementation of Phase 2, and would depend on the extent of the Phase 2 activities and the timing for their implementation.

4.1.2.4 No Action Alternative

Annual activities would include sitewide and SDA monitoring and maintenance. Assumed periodic replacement of building roofs and permeable treatment wall media and refurbishment of the caps for the SDA and NDA would result in increased utility resource use about every 20 to 25 years. Sitewide monitoring and maintenance activities would have the highest annual demand for electricity, natural gas, and sanitary and potable water – that is, an annual requirement of 760 megawatt-hours of electricity, 120,000 cubic meters (4.3 million cubic feet) of natural gas, and 2.6 million liters (700,000 gallons) of potable water. Each Main Plant Process Building roof replacement would require 690 megawatt-hours of electricity, 110,000 cubic meters (3.9 million cubic feet) of natural gas, and 1.1 million liters (290,000 gallons) of potable water. Each SDA cap refurbishment would require 1.2 million liters (330,000 gallons) of potable water, while each NDA cap refurbishment would require about 450,000 liters (120,000 gallons) of potable water.

Considering all monitoring, maintenance, and replacement activities, peak annual electricity, natural gas, and total water use would be about 1.8 percent, 1.1 percent, and 2.3 percent, respectively, of the capacity of WNYNSC utility systems.

Under this alternative, there would be an annual average of about 32 offsite shipments of waste, or 1 shipment roughly every 8 working days. There would be a small increase in construction material shipments during the periods of roof replacement and SDA and NDA cap refurbishment, but the construction effort would not be large. (Construction materials would be dominated by roofing materials, geomembranes, and similar materials.) For this alternative, the direct employment level would be about 75 persons, resulting in a daily average employee traffic level of about 150 vehicle trips. Assuming all traffic to and from WNYNSC would be routed through U.S. Route 219, this daily number of vehicle trips would represent about 2.0 to 2.5 percent of the daily traffic flow on U.S. Route 219.

4.1.3 Geology and Soils

Decommissioning activities at WNYNSC would impact geologic and soil resources. Geologic and soil resources within Cattaraugus County (see Chapter 3, Section 3.3.1.3) consist predominantly of commercial aggregate (sand and gravel) mining and some oil and gas production. Oil and gas resources are developed within Cattaraugus County with active oil and gas production occurring within a 259-square kilometer (100-square mile) area surrounding the WNYNSC. Oil and gas are produced from bedrock sources in this area at depths of 930 to 1,250 meters (3,050 to 4,104 feet) below land surface (NYSDEC 2008b).

The geology and soil resources that could be impacted by the decommissioning activities represent a limited portion of WNYNSC (approximately 80.9 hectares [200 acres] of the 1,352 hectares [3,340 acres]) and a very small fraction of Cattaraugus County resources. Two measures were used to assess the impact of the alternatives on geologic and soil resources. The first measure was the consumption of geologic resources (sand/gravel/clay), under a given alternative, to replace or restore removed or contaminated materials. The second measure considered the impact of changes in distribution of the geologic resources within WNYNSC. Resource consumption or redistribution volumes under all levels of removal or restoration were considered to impact the overall availability of materials over the WNYNSC and Cattaraugus County region. Impacts to geologic resources by alternative are summarized in **Table 4–4**.

Table 4–4 Summary of Geology and Soil Resource Impacts

Impact	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Consumption of Geologic Resources	The Sitewide Removal Alternative would move a moderate amount of geologic resources (1.3 million cubic meters of till and sand and gravel) from the site as part of contamination removal efforts. A slightly greater quantity (to account for compaction) of similar materials would be moved on site and placed in the original configuration to restore the local hydrogeologic properties and topography to existing conditions.	The Sitewide Close-In-Place Alternative would move a slightly greater amount of geologic resources (1.8 million cubic meters of a combination of till and sand and gravel) onto the site for the purpose of construction of the engineered caps.	Phase 1 would move a smaller amount of geologic resources (160,000 cubic meters of a combination of till and sand/gravel) from the site as part of contamination removal. A slightly greater quantity (to account for compaction) would be moved on site and placed in the original configuration to restore the local hydrogeologic properties and topography to existing conditions. Depending on Phase 2 decisions, impacts of this alternative would range between the Sitewide Removal Alternative and the Sitewide Close-In-Place Alternative because of the possible combination or removals, treatments, and engineered cap construction.	Contaminated aggregate resources would remain contaminated. There would be no impact on aggregate resource needs as no backfill materials are required.
Redistribution of Geologic Resources	There is short-term potential for material movement due to erosion as areas are being excavated and filled before the re-establishment of ground cover. Natural erosion would also occur after area restoration is complete.	There is short-term potential for material movement due to exposed geologic material while the engineered caps are being constructed. Some natural erosion would also occur after the area is contoured and vegetated, but it should be less than the Sitewide Removal Alternative because there would be active erosion control measures.	There is short-term potential for material movement due to erosion as the Phase 1 areas are excavated and backfilled before the re-establishment of ground cover. Depending on Phase 2 decision, the nature of longer-term geological resource redistribution by erosion would range between the Sitewide Removal and the Sitewide Close-In-Place Alternatives. Fully restored areas would erode naturally following establishment of ground cover. Areas associated with cap construction could experience slightly accelerated erosion surrounding the cap because of the topographic contouring of the cap (to minimize ponding), relatively impermeable membrane layers in the cap constructions, and the presence of erodible soils outside the cap.	Over the short-term, there would be a slower erosion rate than for the other alternatives because of the lack of land disturbance activities under the No Action Alternative.

Note: To convert from cubic meters to cubic feet, multiply by 35.314.

The preliminary engineering analysis conducted for each of the alternatives developed an estimate of the volume of geologic material that would be moved for each alternative (WSMS 2008a, 2008b, 2008c, 2008d). **Table 4–5** presents a summary of the estimated volumes that would be required to fill areas of exhumation for the Sitewide Removal and Phased Decisionmaking (Phase 1) Alternatives and to construct the engineered cap for the Sitewide Close-In-Place Alternative. For the Sitewide Removal Alternative and Phase 1 of the Phased Decisionmaking Alternative, the volumes of soil and sand and gravel that would be moved are twice those identified in Table 4–5 because contaminated soil must be removed and then replaced.

An evaluation was also completed to determine the availability of rock, aggregate, soil, and products derived from rock and mineral resources to support construction, operational, and closure activities under each of the alternatives (NYSDEC 2008b). The land area to be disturbed and geologic resources consumed, the depth and extent of required excavation work, and the land areas occupied during operations were calculated. Specifically included in this analysis was the provision for borrow materials from onsite quarries and borrow pits. Based on the volume requirements for the different alternatives and limited onsite resources, supplemental borrow materials would be needed from offsite regional sources.

Table 4–5 Major Geologic and Soil Resource Requirements

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Soil (cubic meters)	1,256,000 [a]	877,000	93,000 [a]	Negligible
Sand and gravel (cubic meters)	36,000 [a]	765,000	1,200 [a]	Negligible
Clay/bentonite (cubic meters)	40,000	162,000	69,000	Negligible
Total	1,332,000	1,804,000	163,200	Negligible

[a] The actual volumes moved would be twice the listed number because contaminated material must be removed and then replaced with noncontaminated material.

Note: To convert from cubic meters to cubic feet, multiply by 35.314.

4.1.3.1 Sitewide Removal Alternative

Under the Sitewide Removal Alternative, contaminated soil would be removed and replaced from offsite sources. Approximately 1.3 million cubic meters (1.8 million cubic yards) of soil, sand and gravel, and clay/bentonite would be required, along with concrete, cement, and some grout. The greatest requirements are for soil, concrete, clay, and sand and gravel. Permitted sand and gravel resources in Cattaraugus County consist of approximately 710 hectares (1,750 acres), with an estimated 3,984 life-of-mine acreage (NYSDEC 2008b). Life-of-mine acreage is the total number of acres of mineral reserves that will be mined over the duration of mining at a location, including lands previously reclaimed, areas currently affected by mining, and areas to be affected in the future. Substantial sand and gravel resources are located east of WNYNSC along the Highway 16 corridor in Cattaraugus County (Martin 2000). Clay and till resources are not extensively mined in Cattaraugus County (NYSDEC 2008b); therefore, a borrow area for clay backfill would need to be located.

The construction activities to support removal actions, as well as the removal actions themselves, would create a potential for temporarily accelerated runoff and soil erosion in the disturbed portions of the site. The use of best management practices for runoff and erosion control during construction and WMA closure would be effective in minimizing short-term effects of landscape alteration. Surface runoff and drainage from disturbed areas would be controlled, collected, and conveyed to sediment basins. Areas susceptible to erosion from surface flows would be protected through the use of sediment ponds, rip-rap, silt fences, or other techniques. Mitigation measures are described in Chapter 6 of this EIS. Over the longer term, vegetative cover would be re-established over the areas of removal, and erosion would proceed at a near-natural rate in the previously disturbed areas.

4.1.3.2 Sitewide Close-In-Place Alternative

Under the Sitewide Close-In-Place Alternative, surface topography on the North and South Plateaus would be impacted by the construction of layered engineered caps. Approximately 1.8 million cubic meters (2.3 million cubic yards) of soil, sand and gravel, and soil/bentonite would be required, along with less concrete than that for the Sitewide Removal Alternative, but greater amounts of cement and grout. Most of the material would be used for construction of engineered caps. The major requirements for geologic material (soil, sand and gravel, and rock) can be met from local sources. The requirements for grout to stabilize wastes and residual radioactive waste in piping and other equipment; stabilize disposal holes and trenches at the NDA and the SDA, respectively; and stabilize equipment and structures within the Waste Treatment Facility and Main Plant

Process Building can be met through commercial sources. Concrete demands would be less under this alternative, commensurate with reduced need for new surface facilities construction (WSMS 2008b).

Subsidence associated with cap construction over the burial areas would be minimized through grout injection to fill voids around the buried waste in the NDA and SDA.

Construction of the engineered cap would create the potential for temporarily accelerated runoff and soil erosion in the disturbed portions of the site. The use of best management practices for runoff and erosion control during construction of the cap would minimize short-term erosion. Surface runoff and drainage from disturbed areas would be controlled, collected, and conveyed to sediment basins. Areas susceptible to erosion from surface flows would be protected through the use of sediment ponds, rip-rap, silt fences, or other techniques. Mitigation measures are described in Chapter 6 of this EIS. Over the longer term, erosion would proceed at a rate lower than the natural rate as a result of engineered measures that would be taken to reduce the rate of erosion and, where possible, repair damage caused by erosion.

4.1.3.3 Phased Decisionmaking Alternative

Impacts on the geologic and soil resources under Phase 1 of the Phased Decisionmaking Alternative would be similar to, but would extend over a smaller area than, the Sitewide Removal Alternative because the removal actions of Phase 1 are localized. The impacts for the remaining facility areas, including the South Plateau, would be similar to those for the No Action Alternative.

Phase 2 decisions may result in removal of remaining contamination and structures or in-place closure. Depending on Phase 2 decisions, impacts of this alternative would range between those for the Sitewide Removal and Sitewide Close-In-Place Alternatives because of the possible combination of removals, treatments, and engineered cap construction.

4.1.3.4 No Action Alternative

Under the No Action Alternative, contaminated geologic resources, including sand and gravel and clay till on the North Plateau and clay till on the South Plateau beneath WVDP WMAs, would remain in place and contaminated. Under this alternative, mineral resource requirements (i.e., sand/gravel, clay, and grout) would be negligible.

In the short term, there would be less potential for erosion than for the other alternatives because of the lack of land disturbance activities. Use of best management practices for runoff and erosion control would minimize erosion. The actions would have to continue for the foreseeable future.

4.1.4 Water Resources

Water resource impacts would occur as a result of some of the decommissioning actions at WNYNSC. Construction and excavation activities could lead to increased stormwater runoff, erosion and/or sedimentation, and near-term changes in surface water flow paths. Direct impacts on surface water could result from temporary or permanent grading, rerouting, or filling of surface water resources. Indirect impacts could result from potentially increased or impeded surface flows or be caused by flooding. Groundwater quality would be affected if there are localized changes to flow or changes in infiltration rates with consequent changes to percolation rates of surface water to the groundwater system. Unplanned spills or releases during the construction and operational phases of planned activities could impact surface and groundwater quality.

A summary of impacts of each alternative on water resources is presented in **Table 4–6**.

Table 4–6 Summary of Impacts on Water Resources

Potential Short-term Impacts Affecting Water Quality	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative	No Action Alternative
Floodplain	The Interim Storage Facility may extend into the probable maximum flood floodplain. Only temporary removal actions are projected to occur in the 100-year floodplain.	The Interim Storage Facility may extend into the probable maximum flood floodplain. Engineered barriers on the South Plateau and erosion control features would intrude into the 100-year and PMF floodplain.	For Phase 1, the Interim Storage Facility may extend into the probable maximum flood floodplain. Only temporary removal actions could occur in the 100-year and PMF floodplain. Overall impacts (Phase 1 plus Phase 2) would range between those for the Sitewide Close-In-Place and Removal Alternatives.	No impact.
Surface water flow	Construction or contaminant removal activities of short duration may result in short-term impact on surface flows. Surface water flow patterns would be re-established upon completion of the alternative.	Installation of engineered barriers and erosion control features would result in small-scale, localized changes in surface water flow pattern.	Any Phase 1 sediment removal activities could result in temporary localized impact on surface flows. Overall impacts (Phase 1 and Phase 2) would range between those for the Sitewide Close-In-Place and Sitewide Removal Alternatives.	No change.
Surface water quality	Construction and excavation activities would increase sediment generation that would be locally intercepted and managed to minimize sediment discharges to surface streams. Previously contaminated water (e.g., North Plateau Groundwater Plume), as well as water contaminated as a result of operational spills, would be contained and treated prior to discharge to surface streams.	Construction activities would increase sediment generation that would be locally intercepted and managed to minimize sediment discharges to surface streams. Water contaminated as a result of operational spills would be contained and treated prior to discharge to surface streams.	Phase 1 excavation activities would increase sediment generation that would be locally intercepted and managed to minimize sediment discharges to surface streams. Previously contaminated water (e.g., North Plateau Groundwater Plume), as well as water contaminated as a result of operational spills, would be contained and treated prior to discharge to surface streams. Overall impacts (Phase 1 and Phase 2) would range between those for the Sitewide Close-In-Place and Sitewide Removal Alternatives.	Contaminated water would be treated prior to release. No change in impact.
Groundwater flow	Existing groundwater flow patterns would be re-established upon completion of the alternative.	Groundwater flow patterns would be modified slightly in the immediate area of the Main Plant Process Building and Waste Tank Farm as a result of the local hydrologic barrier designed to increase the hydrologic isolation of contaminated material.	For Phase 1, groundwater flow patterns would be modified slightly in the immediate area of the Main Plant Process Building and Waste Tank Farm as a result of the local groundwater barrier designed to limit groundwater flow between the Main Plant Process Building excavation area and the remaining portion of the North Plateau Groundwater Plume. Overall impacts (Phase 1 and Phase 2) would range between those for the Sitewide Close-In-Place and Sitewide Removal Alternatives.	No change.
Groundwater quality	Groundwater quality would improve as a result of removal actions.	General groundwater quality would be improved as a result of increased hydrologic isolation of radionuclides and hazardous materials.	Groundwater quality in the immediate areas of the Phase 1 removal actions would improve as a result of the removal activities. Overall impacts (Phase 1 and Phase 2) would range between those for the Sitewide Close-In-Place and Sitewide Removal Alternatives.	No change.

PMF = probable maximum flood.

4.1.4.1 Sitewide Removal Alternative

Surface Water Flow and Quality

Contamination removal actions in and around surface streams would result in temporary localized changes in surface water flow patterns. Streamflow would be temporarily diverted from stream sections where contaminated sediment would be removed.

Construction and contamination removal actions across the entire developed portion of the site would result in exposed soils that would be a source of sediment following precipitation events. This sedimentation would cause the greatest risk to local water quality. The impacts of sediment generation would be minimized by limiting exposure surfaces and intercepting and treating runoff from exposed areas prior to release. Sediment treatment measures could include runoff interceptor trenches or swales, filter or silt berms/fences, sediment barriers or basins, rock-lined ditches/swales, slope shaping and retaining fences, surface water runoff management, stormwater drainage structures, and waste management systems (NYSDEC 2005d). After removal actions are complete for a specific area, topsoil would be applied as necessary and the pre-existing surface contour would be re-established along with native vegetation to restore natural sediment minimization features.

Construction and contamination removal operations would also create the potential for spilled materials from construction equipment, including diesel fuel or petroleum, oils, and lubricants. The impacts of fuel, oil, or lubricant spills could be mitigated by keeping the equipment in good repair and conducting maintenance operations in areas designed for such operations.

Nonhazardous sanitary wastewater (i.e., domestic sewage) would be managed via the existing sanitary wastewater collection and treatment system during the construction and operational phases of this alternative, and then via portable sanitary facilities during infrastructure removal. Routine operational impacts on surface water quality would be minimal as there would be no untreated discharge of effluents to surface water during operations.

Liquid effluents from the new Waste Tank Farm Waste Processing Facility would be released to Lagoons 4 and 5, emptied into Lagoon 3, and periodically discharged in accordance with a State Pollutant Discharge Elimination System (SPDES) permit (see Chapter 3, Section 3.6.1, of this EIS). Treated leachate from the new Leachate Treatment Facility would be conveyed to treated water storage tanks where it would be sampled and analyzed for retreatment or discharge in accordance with an SPDES permit or retreatment. The volume of contaminated water produced would be monitored and limited, to the extent practicable, and then treated prior to discharge. Surface water quality impacts from the operation of these two process systems would be minor.

Long-term negative surface water quality impacts would be improved by implementation of the Sitewide Removal Alternative because less residual contamination would be on site and natural features to reduce sediment loss would be restored.

Floodplains

Preliminary analysis indicates that the proposed location for the Interim Storage Facility is near the probable maximum flood (PMF) floodplain, and additional analysis would be necessary during the detailed design for this facility. While there would be no construction in the 100-year floodplain for this alternative, there would be limited temporary activities within the floodplain while sediments are removed from the local streams.

No permanent losses to the 100-year or PMF floodplain areas in the WNYNSC vicinity would result from implementation of the Sitewide Removal Alternative, and loss of flood storage volume would not occur.

Groundwater Flow and Quality

Contamination removal operations, particularly on the North Plateau, would involve engineered barriers to control local groundwater flow during removal operations. Groundwater in the area of the North Plateau Groundwater Plume would be isolated using a sheet pile barrier installed around the perimeter of the area to be excavated. Plume dewatering would be initiated using several groundwater sumps and a series of interconnected subsurface drains.

Area excavations would be backfilled with clean soils and graded to restore the area to a natural appearance that approximates natural conditions for the site. Over the long term, implementation of the Sitewide Close-In-Place Alternative would have a positive impact on groundwater quality.

4.1.4.2 Sitewide Close-In-Place Alternative

Surface Water Flow and Quality

Construction of the multi-layer cap would result in localized changes in surface water flow patterns around the North Plateau and South Plateau caps. There would also be changes in the localized flow pattern in Erdman Brook and Franks Creek as a result of proposed erosion control features and the extension of the multi-layered engineered cap.

The construction of close-in-place features such as the slurry walls and multi-layer caps would result in exposed soils that would be a source of sediment following precipitation events. This sedimentation would cause the greatest risk to local water quality, but would be of short duration. The impacts of sediment generation would be minimized by limiting exposure surfaces and intercepting and treating runoff from exposed areas prior to release. Sediment treatment measures could include runoff interceptor trenches or swales, filter or silt berms/fences, sediment barriers or basins, rock-lined ditches/swales, slope shaping and retaining fences, surface water runoff management, stormwater drainage structures, and waste management systems (NYSDEC 2005d). After close-in-place actions are complete for a specific area, rock and vegetated soils would be used to reduce sedimentation to natural rates.

Close-in-place actions would also create the potential for spilled materials from construction equipment, including diesel fuel or petroleum, oils, and lubricants. The impacts of fuel, oil, or lubricant spills would be mitigated by keeping the equipment in good repair and conducting maintenance operations in areas designed for such operations.

Floodplains

Preliminary analysis indicates that the proposed location for the Interim Storage Facility is near the PMF floodplain, and additional analysis would be necessary during detailed design for this facility. In addition, the multi-layer caps for the NDA and SDA on the South Plateau would intrude into the 100-year floodplain, and the conceptual design for long-term erosion control features extends into the 100-year floodplain of Erdman Brook and Franks Creek (see Appendix M, Figure M–8, of this EIS). These erosion control structures would increase water flow around two sides of WMA 8 in the proximity of the floodplain. This redirection of water to Franks Creek would increase the potential for erosion from the increased flow. Additional analysis on the impact of these facilities on the floodplain would have to be developed during the detailed design phase if this alternative were selected.

Groundwater Flow and Quality

Engineered barriers that are part of the in-place closure design would direct local groundwater flow away from the larger inventories of radionuclides and hazardous chemicals. These engineered barriers would help isolate the hazardous materials and improve groundwater quality in the areas downgradient of the barriers.

A long-term hazardous chemical material transport analysis was conducted to estimate the concentration of hazardous chemical materials in surface streams over long timeframes. This release and transport analysis developed estimates of the peak nonradiological hazardous chemical material concentration in Cattaraugus Creek at the WNYNSC boundary. These concentrations were divided by the maximum contaminant level (MCL)[7] concentration for the specific hazardous chemical to develop a unitless Hazard Index. A Hazard Index of less than 1 indicates that no adverse health effects would be expected as a result of exposure. For the Sitewide Close-In-Place Alternative and assuming indefinite continuation of institutional controls, the highest Hazard Index at Cattaraugus Creek for the entire site was less than 0.01 for soluble uranium from the SDA about 4,700 years in the future, and less than 0.01 for lead from the Vitrification Facility about 26,000 years into the future. The Hazard Index for releases from other facilities was at least two orders of magnitude lower (see Appendix H, Table H–32, of this EIS). This analysis suggests that there would be no serious long-term impact to Cattaraugus Creek water quality under the Sitewide Close-In-Place Alternative.

4.1.4.3 Phased Decisionmaking Alternative

Surface Water Flow and Quality

Phase 1 removal actions would not impact surface water flow patterns or quantity.

Phase 1 removal actions would result in exposed soils that would be a source of sediment following precipitation events. The impacts of sediment generation would be minimized by limiting exposure surfaces and intercepting and treating runoff from exposed areas prior to release. Sediment treatment measures could include runoff interceptor trenches or swales, filter or silt berms/fences, sediment barriers or basins, rock-lined ditches/swales, slope shaping and retaining fences, surface water runoff management, stormwater drainage structures, and waste management systems (NYSDEC 2005d). After removal actions are complete for a specific area, topsoil would be applied as necessary, and the pre-existing surface contour would be re-established along with native vegetation to restore natural sediment minimization features.

Phase 1 removal actions would also create the potential for spilled materials from construction equipment, including diesel fuel or petroleum, oils, and lubricants. The impacts of fuel, oil, or lubricant spills could be mitigated by keeping the equipment in good repair and conducting maintenance operations in areas designed for such operations.

Nonhazardous sanitary wastewater (i.e., domestic sewage) would be managed via the existing sanitary wastewater collection and treatment system during the construction and operational phases of this alternative, and then via portable sanitary facilities during infrastructure removal. Routine operational impacts on surface water quality would be minimal as there would be no untreated discharge of effluents to surface water during operations.

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[7] *Maximum contaminant level is the designation for U.S. Environmental Protection Agency (EPA) standards for drinking water quality under the Safe Drinking Water Act. The MCL for a given substance is the maximum permissible concentration of that substance in water delivered by a public water system.*

The overall impacts of the Phased Decisionmaking Alternative would depend on the decisions about Phase 2. If the Phase 2 decision is for total removal of the remaining facilities and areas, overall impacts would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision is close-in-place of the remaining facilities and areas, overall impacts would be closer to those for the Sitewide Close-In-Place Alternative because of the impacts of the engineered multi-layered caps and erosion control features that would extend into Erdman Brook and Franks Creek.

Floodplains

Preliminary analysis indicates that the proposed location for the Interim Storage Facility is near the PMF floodplain, and additional analysis would be necessary during the detailed design for this facility. While there would be no construction in the 100-year floodplain for Phase 1 removal actions, there could be limited temporary activities within the floodplain if sediments are removed from the local streams.

No permanent losses to the 100-year or PMF floodplain areas in the WNYNSC vicinity would result from implementation of the Phase 1 removal actions and loss of flood storage volume would not occur.

The overall impacts of the Phased Decisionmaking Alternative would depend on decisions about Phase 2. If the Phase 2 decision is to remove the remaining facilities and areas, overall impacts would be similar to those for the Sitewide Removal Alternative (no long-term impacts on the floodplain except for potential impacts from the Interim Storage Facility). If the Phase 2 decision is to close-in-place the remaining facilities and areas, overall impacts would be closer to those for the Sitewide Close-In-Place Alternative because the engineered multi-layered caps and erosion control features would extend into the 100-year floodplain.

Groundwater Flow and Quality

The downgradient portion of the subsurface hydraulic barrier installed to control groundwater during removal of the Main Plant Process Building would remain in place after the excavated area is backfilled. In addition, there would be a barrier on the western side of the present location of Lagoons 1 through 3. These would result in localized changes of the groundwater flow on the North Plateau. The removal of the source area for the North Plateau Groundwater Plume would improve local water quality.

The overall impact of the Phased Decisionmaking Alternative on groundwater flow and quality depends on the Phase 2 decisions. If the Phase 2 decision is to remove the remaining facilities and areas, the total impacts would be similar to those for the Sitewide Removal Alternative. If the Phase 2 decision is close-in-place for the remaining facilities and areas, the total impacts would be similar to those for the Sitewide Close-In-Place Alternative, although they would be a little less because the Main Plant Process Building, North Plateau Groundwater Plume source area, and Lagoons 1 through 3 would have been removed.

The continued maintenance of some facilities, while decontaminating and decommissioning others, would result in some short-term groundwater quality impacts under Phase 2 of the Phased Decisionmaking Alternative. Phase 1 activities would serve to stabilize and/or remove contaminated media from site premises. Phase 2 activity groundwater quality impacts are expected to result in improved long-term groundwater quality as a result of contamination removal actions that would have already occurred during Phase 1 and would continue during Phase 2. If the future Phase 2 decision is close-in-place, groundwater quality impacts are expected to be less than those identified for the Sitewide Close-In-Place Alternative for remaining Phase 2 in-place closure actions.

4.1.4.4 No Action Alternative

Surface Water Quality

Since no decommissioning or long-term management actions would take place under the No Action Alternative, surface water quality changes from the present baseline condition would not occur, assuming continuance of monitoring and maintenance activities. Repair and maintenance of facilities would not result in short-term impacts to surface water quality.

Floodplains

No decommissioning activities would take place under the No Action Alternative; therefore, no floodplain impacts would occur.

Groundwater Flow and Quality

Implementation of the No Action Alternative would not cause any near-term changes in groundwater infiltration rates or result in new contamination that could migrate to groundwater.

A long-term hazardous material transport analysis was conducted to estimate the concentration of hazardous chemical materials in the surface streams over long timeframes. This release and transport analysis developed estimates of the peak nonradiological hazardous material concentration in Cattaraugus Creek at the WNYNSC boundary. These concentrations were divided by the MCL concentration for the specific hazardous chemical to develop a unitless Hazard Index. A Hazard Index of less than 1 indicates that no adverse health effects would be expected. For the No Action Alternative and assuming indefinite continuation of institutional controls, the highest Hazard Index for the entire site was about 0.008 for soluble uranium from the SDA about 4,500 years in the future. The Hazard Index for other chemicals was at least one order of magnitude lower. (See Appendix H, Table H–32, of this EIS.) This analysis suggests that long-term water quality in Cattaraugus Creek and Buttermilk Creek would exceed MCLs under the No Action Alternative.

4.1.5 Air Quality and Noise

Air quality and levels of noise would be affected by decommissioning actions at the West Valley Site. Indicators of impacts to nonradiological air quality include exceedance of Federal or State ambient air quality standards for criteria air pollutants, hazardous air pollutants, or other toxic pollutants. Indicators for noise are an increase in day or night average sound level at sensitive receptors. A summary of the impacts for each alternative on air quality and noise is presented in **Table 4–7**. None of the alternatives would annually release greenhouse gases in the form of carbon dioxide exceeding 5,400 metric tons (6,000 tons), which represents about 0.00009 percent of the U.S. release in 2005 (EPA 2007d).

4.1.5.1 Air Quality – Nonradiological Releases

Closure activities; construction, operation, and demolition of facilities used for closure; and monitoring and maintenance activities would result in emissions of nonradiological criteria and toxic pollutants from construction equipment, trucks, treatment facilities, and employee vehicles. Particulate emissions from wind and equipment disturbance of soil would also occur. Criteria pollutant emissions were compiled for the activities occurring under each alternative to determine total emissions by year of implementation. Air pollutant concentrations were modeled for carbon monoxide, nitrogen dioxide, particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and sulfur dioxide for the year with the highest emissions (see Appendix K of this EIS). Concentrations were modeled at the WNYNSC boundary and along public roads passing through WNYNSC.

Table 4–7 Summary of Air Quality and Noise Impacts

Environmental Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Air Quality	Peak year activity meets ambient standards, except possibly $PM_{2.5}$ for 24-hour standard.	Peak year activity meets ambient standards, except possibly $PM_{2.5}$ and PM_{10} for 24-hour standards.	For Phase 1, peak year activity meets ambient standards, except possibly $PM_{2.5}$ for 24-hour standard. For the entire alternative (Phase 1 plus Phase 2), impacts would be bounded by those for the Sitewide Removal and Sitewide Close-In-Place Alternatives.	Peak year activity meets ambient standards, except possibly $PM_{2.5}$ for 24-hour standard.
Noise	Temporary elevated noise levels at nearest residences when equipment activity is near the site boundary.	Temporary elevated noise levels at nearest residences when equipment activity is near the site boundary.	For both Phase 1 and Phase 2, temporary elevated noise levels at nearest residences when equipment activity is near the site boundary.	Negligible increase in noise levels at nearby residences.

$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns.

Description of Affected Resources—Air pollution refers to the introduction, directly or indirectly, of any substance into the air that could:

- Endanger human health,
- Harm living resources and ecosystems,
- Damage material property, or
- Impair or interfere with the comfortable enjoyment of life and other legitimate uses of the environment.

For the purpose of this EIS, only outdoor air pollutants were addressed. They may be in the form of solid particles, liquid droplets, gases, or a combination of these forms. Generally, they can be categorized as primary pollutants (those emitted directly from identifiable sources) and secondary pollutants (those produced in the air by interaction between two or more primary pollutants or by reaction with normal atmospheric constituents that may be influenced by sunlight). Air pollutants are transported, dispersed, or concentrated by meteorological and topographical conditions. Thus, air quality is affected by air pollutant emission characteristics, meteorology, and topography.

Ambient air quality in a given location can be described by comparing the concentrations of various pollutants in the atmosphere with appropriate standards. Ambient air quality standards have been established by Federal and state agencies, allowing an adequate margin of safety for the protection of public health and welfare from the adverse effects of pollutants in the ambient air. Pollutant concentrations higher than the corresponding standards are considered unhealthy; those below such standards are considered acceptable.

The pollutants of concern are primarily those for which Federal and state ambient air quality standards have been established, including criteria air pollutants, hazardous air pollutants, and other toxic air compounds. Criteria air pollutants are those listed in 40 *Code of Federal Regulations* (CFR) Part 50, "National Primary and

Secondary Ambient Air Quality Standards." Hazardous air pollutants and other toxic compounds are those listed in Title I of the Clean Air Act, as amended (42 United States Code [U.S.C.] 7401 *et seq*.), those regulated by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 61), and those that have been proposed or adopted for regulation by the applicable state or are listed in state guidelines. States may set ambient standards that are more stringent than the National Ambient Air Quality Standards (NAAQS). The more stringent of the state or Federal standards is shown in this document. For the purpose of this EIS, carbon monoxide, nitrogen dioxide, PM_{10}, $PM_{2.5}$, and sulfur dioxide were evaluated since they are the primary pollutants emitted from diesel construction equipment and from earth-moving activities (fugitive dust). Ozone precursors, nitrogen dioxide, and volatile organic compounds were considered or discussed in Appendix K of this EIS. Lead would be emitted in such small quantities under the alternatives that it was not considered in this analysis. Toxic pollutants are emitted from diesel equipment. For the purpose of this EIS, benzene was evaluated as one of the primary toxic pollutants from diesel equipment.

Emissions of airborne radionuclides are regulated by the U.S. Environmental Protection Agency (EPA) under 40 CFR Part 61, Subpart H, "National Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." These emissions and compliance with this standard are discussed in Section 4.1.9 of this chapter. DOE activities at WVDP must comply with handling and reporting requirements of the NESHAP for asbestos (40 CFR Part 61, Subpart M, "National Emission Standards for Asbestos").

Areas having air quality that meets the NAAQS for criteria air pollutants are designated as "attainment areas," while areas having air quality that does not meet the NAAQS for such pollutants are designated as "nonattainment areas." Areas may be designated as "unclassified" when sufficient data for attainment-status designation are lacking. Attainment-status designations are assigned by county, metropolitan statistical area, consolidated metropolitan statistical area (or portions thereof), or air quality control regions. Air quality control regions designated by the EPA and attainment-status designations are listed in 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purposes."

For locations that are in an attainment area for criteria air pollutants, Prevention of Significant Deterioration (PSD) regulations limit pollutant emissions from new or modified sources and establish allowable increments of pollutant concentrations. Three PSD classifications are specified, with the criteria for classification established in the Clean Air Act. Class I areas include national wilderness areas, memorial parks larger than 2,020 hectares (5,000 acres), national parks larger than 2,430 hectares (6,000 acres), and areas that have been redesignated as Class I. Class II areas are all areas not designated as Class I. No Class III areas have been designated (42 U.S.C. 7472 *et seq.*).

The ROI for air quality encompasses an area surrounding a candidate site that is potentially affected by air pollutant emissions caused by implementation of the alternatives. The air quality impact area normally evaluated is the area in which concentrations of criteria pollutants would increase more than a significant amount in a Class II area (on the basis of averaging period and pollutant: 1 microgram per cubic meter for the annual average for sulfur dioxide, nitrogen dioxide, and PM_{10};[8] 5 micrograms per cubic meter for the 24-hour average for sulfur dioxide and PM_{10}; 500 micrograms per cubic meter for the 8-hour average for carbon monoxide; 25 micrograms per cubic meter for the 3-hour average for sulfur dioxide; and 2,000 micrograms for the 1-hour average for carbon monoxide [40 CFR 51.165]). Generally, this covers a few kilometers downwind from the source. Further, for sources within 100 kilometers (60 miles) of a Class I area, the air quality impact area evaluated would include the Class I area if the increase in concentration of any air pollutants for which there are PSD increments is greater than 1 microgram per cubic meter (24-hour average). The area of the ROI depends on emission source characteristics, pollutant types, emission rates, and meteorological and

[8] *Particulate matter with an aerodynamic diameter less than or equal to 10 microns (10 microns = .00001 meters or .0004 inches).*

topographical conditions. For the purpose of this nonradiological air quality analysis, impacts were evaluated at the WNYNSC boundary and along roads within WNYNSC to which the public has access.

Baseline air quality is typically described in terms of pollutant concentrations modeled for existing sources and background air pollutant concentrations measured near the site. For this EIS, monitoring data are presented for the nearest State air pollutant monitors discussed in Chapter 3, Section 3.7.

Description of Impact Assessment—The impacts of pollutant emissions from construction, operation, and closure activities on air quality were evaluated for each alternative. This assessment included a comparison of pollutant concentrations under each alternative with applicable Federal and State ambient air quality standards. If both Federal and State standards exist for a given pollutant and averaging period, compliance was evaluated using the more stringent standard. Air pollutant emissions data for each alternative were based on conservative engineering analyses (see Appendix K of this EIS).

For each alternative, contributions to offsite air pollutant concentrations were modeled on the basis of guidance presented in EPA's "Guideline on Air Quality Models" (40 CFR Part 51, Appendix W). The EPA ISCST3 computer model was selected as an appropriate model. The modeling analysis incorporated conservative assumptions, which tend to overestimate pollutant concentrations as discussed in Appendix K of this EIS. Modeled concentrations for each pollutant and averaging time were compared with the applicable standards. The concentrations presented were the maximum occurring at or beyond the WNYNSC boundary, the highest sixth-high 24-hour concentration for PM_{10}, and the average eighth highest 24-hour concentration for $PM_{2.5}$, which represents the 98^{th} percentile value used to evaluate compliance with the 24-hour $PM_{2.5}$ standard. The highest sixth-high 24-hour concentration for PM_{10} is the value that EPA recommends for evaluating compliance with the 24-hour PM_{10} standard. This value is the highest of the sixth-high values at all the receptors during a 3-year period. For the purpose of this analysis, 5 years of modeling results were used.

Sitewide Removal Alternative

The concentrations appropriate for comparison to ambient standards and guidelines under the Sitewide Removal Alternative for each pollutant and averaging time and the corresponding ambient standards are presented in **Table 4–8**. The highest concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 60 to the northwest and west-southwest. The annual concentration would be less than 28 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be less than 37 percent of the standard if a background concentration were added to the modeling results. The concentrations at the WNYNSC boundary for $PM_{2.5}$ for the annual and average eighth highest 24-hour average concentration were identified in year 55 to the northwest and southwest, respectively. The annual concentration would be less than 1 percent of the standard and less than 75 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be less than 8 percent of the standard and about 104 percent of the standard if a background concentration were added to the modeling results. The primary contributor to these particulate matter concentrations is North Plateau Groundwater Plume exhumation. The annual average emissions of carbon dioxide over the 64-year period would be about 5,400 metric tons (6,000 tons), representing about 0.00009 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below ambient standards and guidelines.

Air pollutant emissions from operation of the three new facilities (Soil Drying Facility, Leachate Treatment Facility, and Container Management Facility) under this alternative would be small and not subject to PSD regulations. Therefore, a PSD increment analysis is not required.

Table 4–8 Nonradiological Air Pollutant Concentrations by Alternative

Criteria Pollutant	Averaging Period	Most Stringent Standard or Guideline (micrograms per cubic meter) [a]	Background (micrograms per cubic meter) [b]	Maximum Incremental Concentration (micrograms per cubic meter) [c]			
				Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase 1) [d]	No Action Alternative
Carbon monoxide	8 hours 1 hour	10,000 [f] 40,000 [f]	3,500 7,000	199 1,130	197 1,120	131 571	30 163
Nitrogen dioxide	Annual	100 [f]	30	0.42	1.24	0.722	0.122
PM_{10}	Annual 24 hours	45 [g] 150 [h]	13 28	0.871 27.5	5.82 214 [e]	0.901 39.3	0.408 16.5
$PM_{2.5}$	Annual 24 hours	15 [h] 35 [h]	11 34	0.122 2.47 [e]	0.77 23.3 [e]	0.161 4.18 [e]	0.062 1.73
Sulfur dioxide	Annual 24 hours 3 hours	80 [f] 365 [f] 1,300 [f]	7.9 34 94	0.0008 0.0502 0.276	0.00234 0.0665 0.398	0.00142 0.0798 0.451	0.00015 0.0104 0.058
Benzene	Annual 1 hour	0.13 [i] 1,300 [i]	NR NR	0.00133 1.28	0.00093 0.899	0.00063 0.466	0 0

NR = not reported, PM_{10} = particulate matter less than or equal to 10 microns in diameter, $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter.

[a] The more stringent of the Federal and State standards is presented if both exist for the averaging period. Other than those for ozone, particulate matter, and lead, and those based on annual averages, the NAAQS are not to be exceeded more than once per year (40 CFR Part 50). The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. The 24-hour PM_{10} standard is met when the expected number of exceedances is 1 or less over a 3-year period. The 24-hour $PM_{2.5}$ standard is met when the 3-year average of the 98th percentile 24-hour averages is less than or equal to the standard. The annual $PM_{2.5}$ standard is met when the 3-year average of the annual means is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million. Values have been converted to micrograms per cubic meter.

[b] Based on ambient monitoring data from Chapter 3, Section 3.7.

[c] Concentrations were analyzed at locations to which the public has continual access and at the WNYNSC boundary.

[d] Air quality impacts from the entire Phased Decisionmaking Alternative, including Phases 1 and 2, would be expected to be bounded by the impacts from the Sitewide Removal and Sitewide Close-In-Place Alternatives (see discussion in the text).

[e] Standard could be exceeded when background is added to the modeled increment for this alternative.

[f] Federal and New York State standard.

[g] New York State standard.

[h] Federal standard.

[i] New York State air toxic guidance.

The Final Rule for "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (40 CFR Parts 51 and 93) requires a conformity determination for certain-sized projects in nonattainment areas. A conformity determination is not necessary to meet the requirements of the conformity rule for the alternatives considered in this EIS, because WNYNSC is located in an attainment area for all criteria pollutants (DOE 2000a).

Sitewide Close-In-Place Alternative

Under the Sitewide Close-In-Place Alternative, the highest concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 6 to the southeast. These concentrations would be attributable primarily to WMA 8 closure and erosion control system replacement and would be about 143 percent of the 24-hour ambient standard. The annual concentration would be less than 38 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be about 161 percent of the standard if a background concentration were added to the modeling results. The concentrations at the WNYNSC boundary or nearest public road for $PM_{2.5}$ for the annual and 24-hour concentrations were identified in year 6 to the southeast and south-southeast. These concentrations would be attributable primarily to WMA 8 closure and erosion control system replacement. The annual concentration would be about 5 percent of the standard and about 78 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be about 67 percent of the standard and about 164 percent of the standard if a background concentration were added to the modeling results. The annual average emissions of carbon dioxide would be about 1,810 metric tons (1,990 tons), representing about 0.00003 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below the ambient standards and guidelines.

Phased Decisionmaking Alternative

Under Phase 1 of the Phased Decisionmaking Alternative, the highest 24-hour concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 6 to the northwest and west-northwest. These concentrations would be attributable primarily to WMA 5 (Waste Storage Area) closure, WMA 9 (Radwaste Treatment System Drum Cell) closure, and WMA 1 closure surface structure removal and subsurface soil removal. These concentrations would be less than 27 percent of the 24-hour ambient standard. The annual concentration would be less than 28 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be less than 45 percent of the standard if a background concentration were added to the modeling results. The concentrations at the WNYNSC boundary or nearest public road for $PM_{2.5}$ for the annual and 24-hour concentrations were identified in year 6 to the northwest and west-southwest. These concentrations would be attributable primarily to WMA 1 closure, WMA 5 closure, and WMA 9 closure. The annual concentration would be about 1 percent of the standard and about 74 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be about 12 percent of the standard and about 109 percent of the standard if a background concentration were added to the modeling results. The annual average emissions of carbon dioxide over a 30-year period would be about 2,630 metric tons (2,900 tons), representing about 0.00004 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below the ambient standards and guidelines.

Air quality impacts from the entire Phased Decisionmaking Alternative, including Phases 1 and 2, would be expected to be bounded by the impacts from the Sitewide Removal and Sitewide Close-In-Place Alternatives. This assumes that the rate at which activities are performed would be similar to that under these alternatives and result in similar emission rates. Some variation of actual emissions during any year would result from variations in the schedule and overlap of activities. Concentrations of air pollutants would be expected to be below the ambient standards and guidelines, except for PM_{10} and $PM_{2.5}$.

No Action Alternative

Under the No Action Alternative, the highest concentrations at the WNYNSC boundary or public road for PM_{10} for the annual and 24-hour averaging periods were identified in year 15 to the southeast and south-southeast. These concentrations would be attributable primarily to SDA cap replacement. The 24-hour concentration would be less than 11 percent of the 24-hour ambient standard. The annual concentration would be less than 1 percent of the ambient standard. The annual concentration would be less than 27 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be less than 30 percent of the standard if a background concentration were added to the modeling results. The highest concentrations at the WNYNSC boundary or nearest public road for $PM_{2.5}$ for the annual and 24-hour concentration were identified in year 15 to the southeast and south-southeast. The annual concentration would be less than 1 percent of the standard and about 74 percent of the standard if a background concentration were added to the modeling results. The 24-hour concentration would be about 5 percent of the standard and about 102 percent of the standard if a background concentration were added to the modeling results. The annual average emissions of carbon dioxide would be about 44 metric tons (49 tons), representing about 0.0000007 percent of the U.S. emissions of carbon dioxide in 2005 (EPA 2007d). Concentrations of other pollutants would be well below the ambient standards and guidelines.

4.1.5.2 Radiological Releases

Radiological releases to air and water are addressed in Section 4.1.9, Human Health and Safety During Decommissioning Activities, of this chapter.

4.1.5.3 Noise

Noise, or sound, results from the compression and expansion of air or some other medium when an impulse is transmitted through it. Propagation of sound is affected by various factors, including meteorology, topography, and barriers. Noise is undesirable sound that interferes or interacts negatively with the human or natural environment. Noise can disrupt normal activities (e.g., hearing and sleep), damage hearing, or diminish the quality of the environment.

Noise-level measurements used to evaluate the effects of nonimpulsive sound on humans are compensated by an A-weighting scale that accounts for the hearing response characteristics (i.e., frequency) of the human ear. Noise levels are expressed in decibels, or in the case of A-weighted measurements, decibels A-weighted (dBA). EPA has developed noise-level guidelines for different land use classifications (EPA 1974). EPA guidelines identify a 24-hour exposure level of 70 decibels as the level of environmental noise that will prevent any measurable hearing loss over a lifetime. Likewise, levels of 55 decibels outdoors and 45 decibels indoors are identified as preventing activity interference and annoyance.

Noise from closure, construction, and operation of the closure facilities and associated traffic could affect human and animal populations. The ROI for WNYNSC includes the site and surrounding areas, including transportation corridors, where proposed activities might increase noise levels. Transportation corridors most likely to experience increased noise levels are those roads within a few kilometers of the site boundary that carry most of the site's employee and shipping traffic.

No noise-level data representative of site environs were available. The acoustic environment was briefly described in terms of existing noise sources and nearby land uses.

Impact Assessment

Noise impacts associated with the alternatives may result from construction, operations, and closure activities, including increased traffic. Impacts of proposed activities under each alternative were assessed according to the types of noise sources and the location of the activities relative to the site boundary and noise-sensitive receptors. Potential noise impacts of traffic were assessed based on the likely increase in traffic volume. Possible impacts on wildlife were evaluated based on the possibility of sudden loud noises occurring during site activities under each alternative.

Construction, operation, and demolition of facilities used for closure would result in some increase in noise levels near the area from construction and demolition equipment and activities. Equipment that would be expected to be used includes front-end loaders, bulldozers, graders, compactors, trucks, and lifts. Several pieces of such equipment could operate at one time. Equipment would operate closest to the WNYNSC boundary while removing sediment of the South Reservoir during WMA 12 closure and within 801 meters (2,670 feet) of the nearest residence. During activity at the Cesium Prong, equipment would be operated 519 meters (1,730 feet) from the nearest residence; and during activities at the North Plateau Groundwater Plume, equipment would be operated 1,182 meters (3,940 feet) from the nearest residence. If 5 pieces of equipment were operating at the same time (2 trucks, grader, dozer, and loader), the noise level at these residences would be about 59, 63, and 56 dBA, respectively (WSMS 2008e). This noise would be audible above the background sound levels in the area. Noise from this activity and other activities near the WNYNSC boundary would occur during daytime hours and could be a source of annoyance to nearby residents. Some disturbance of wildlife within WNYNSC could occur as a result of the operation of earth-moving equipment and other equipment. During many of the closure activities, there would be no change in day/night average sound levels and noise impacts on the public outside of WNYNSC, except for noise attributable to construction employee vehicles and trucks hauling materials and waste.

The duration of noise-producing activities would vary for the different alternatives. The Sitewide Removal Alternative would have heavy diesel construction equipment in operation over a period of 64 years. Under the Sitewide Close-In-Place Alternative, heavy diesel construction equipment would be in operation over a period of 7 years, with additional activity at intervals. The Phased Decisionmaking Alternative would have one period of heavy equipment operation during Phase 1. During Phase 2, similar heavy diesel construction equipment operation would be expected. The duration of these activities would be expected to be bounded by the duration of the Sitewide Removal Alternative.

Monitoring and maintenance activities and construction activities, such as geomembrane replacement under the No Action Alternative, would result in some increase in noise levels near the activity area, primarily from construction equipment. Several pieces of equipment could be expected to be operated at one time. Equipment would be expected to operate closest to the WNYNSC boundary while in the SDA. This activity would occur about 1,500 meters (5,000 feet) from the nearest residences. If two pieces of equipment were operating simultaneously, the noise level at these residences would be about 43 dBA. This noise would be barely audible above background sound levels in the area. Noise from this activity and other construction-type activities would occur during daytime hours and would not be a source of annoyance to nearby residents. Some disturbance of wildlife within WNYNSC could occur as a result of equipment operation. During routine monitoring and maintenance, there would be no change in day/night average sound levels and noise impacts on the public outside of WNYNSC as a result of these activities, except for noise attributable to employee vehicles and trucks.

4.1.6 Ecological Resources

Impacts on ecological resources may occur as a result of land disturbance, water use, human activity, and noise resulting from the construction, operation, and removal of facilities associated with the decommissioning or long-term management of WNYNSC. Likely impacts would include habitat loss (including wetlands) and increased mortality of wildlife, as well as indirect impacts such as displacement of wildlife from the affected area. Habitat loss was measured quantitatively in terms of the extent of plant community loss or modification. Indirect impacts were evaluated qualitatively. Impacts on threatened and endangered species during construction of facilities were determined in a manner similar to that for other terrestrial and aquatic resources.

A summary of the impacts of each alternative on ecological resources is presented in **Table 4–9**. Potential measures to mitigate impacts to ecological resources are addressed in Chapter 6, Section 6.5, of this EIS and throughout this section, as appropriate.

4.1.6.1 Sitewide Removal Alternative

Under the Sitewide Removal Alternative, a number of new temporary facilities would be built to support decommissioning activities. Decommissioning would also involve the decontamination and removal of all site facilities and the removal or alteration of numerous manmade and natural water bodies. Additionally, the North Plateau Groundwater Plume and Cesium Prong would be remediated by removing contaminated soil to levels allowing for unrestricted use.

Table 4–9 Summary of Ecological Resources Impacts

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Terrestrial Habitat	Loss of about 16.6 hectares of woodlands and fields as a result of remediation of that portion of the Cesium Prong located outside the disturbed portion of the site.	Minimal impacts since most development would take place on disturbed portions of the site. However, erosion control measures would disturb 10.1 hectares of woodlands and fields.	Minimal impacts under Phase 1, since only developed portions of the site would be impacted. During Phase 2, the loss of terrestrial habitat could range from 10.1 to 16.6 hectares.	No change in terrestrial habitat resources.
Wetlands	Direct impact to 2.8 hectares and potential indirect impacts to other wetland areas.	Direct impact to 1.8 hectares and potential indirect impacts to other wetland areas.	No direct or indirect impacts to site wetland areas under Phase 1. Direct impacts to wetlands under Phase 2 could range from 1.8 hectares to 2.8 hectares.	No change in wetland resources.
Aquatic	Direct and indirect impacts to site streams, ponds, lagoons, and reservoirs.	Direct and indirect impacts to site streams, ponds, lagoons, and reservoirs.	Minimal impacts to aquatic resources during Phase 1. During Phase 2, impacts could range from few additional impacts over Phase 1 to direct and indirect impacts to aquatic resources associated with work in streams and reservoirs.	No change in aquatic resources.
Threatened and Endangered Species	No impacts to Federal or state-listed endangered, threatened, or candidate species. Potential direct and indirect impacts to two New York State Natural Heritage Program ranked species of tiger beetle.	No impacts to Federal or state-listed endangered, threatened, or candidate species. Minimal potential for indirect impacts to two New York State Natural Heritage Program ranked species of tiger beetle.	No impacts to Federal and state threatened and endangered species during either Phase 1 or 2. During Phase 1, minimal indirect impacts to two New York State Natural Heritage Program ranked species of tiger beetle. During Phase 2, impacts to the two species of tiger beetle could range from no impact to potential direct and indirect impacts.	No impacts.

Note: To convert hectares to acres, multiply by 2.471.

Terrestrial Resources

Construction of new temporary facilities would disturb 11.3 hectares (28 acres). However, because all construction would take place within the disturbed portion of the site, there would be no direct loss of habitat. Wildlife in adjacent habitat could be disturbed by noise and increased human presence, which could cause some animals to temporarily move from the area, while others would adapt. Proper maintenance of equipment and restricting workers to the work zone would help mitigate this impact.

Impacts to terrestrial resources would also result from demolition, excavation, and land-clearing activities, including those associated with remediation of the North Plateau Groundwater Plume and the Cesium Prong. Since most activities are associated with the removal of existing structures in disturbed areas, impacts would be minimal. However, remediation of the Cesium Prong would involve the clearing of about 16.6 hectares (41 acres) of woodlands and fields located outside of the disturbed portion of the site. Following the removal of contaminated soil to levels permitting unrestricted use, disturbed areas would be regraded and revegetated according to a sitewide revegetation plan that would be approved by the State.

Impacts of clearing operations associated with the remediation of the undisturbed portion of the Cesium Prong would include the loss of less mobile species (e.g., mice, rabbits, snakes, and squirrels), as well as displacement of other more mobile species (e.g., birds and large mammals). Depending on whether the areas to which displaced animals moved were at or below their carrying capacity (i.e., the maximum number of animals of a particular species that the area could support), the ecosystem dynamics could be altered, possibly leading to the loss of the relocated animals. Prior to land-clearing operations, the areas to be disturbed would be surveyed for nests of migratory birds in accordance with the Migratory Bird Treaty Act. It might be necessary to undertake clearing operations prior to or after the breeding season to mitigate impacts to migratory birds. Indirect impacts to wildlife from increased presence of humans and noise could also disturb animals in adjacent habitat. Upon restoration of the site, it would once again be available to wildlife.

Wetlands

No wetlands would be affected during construction of temporary facilities, because none are present on the proposed building sites. However, wetlands would be directly and indirectly impacted by demolition and remediation activities, particularly during remediation of the Cesium Prong. Indirect impacts could include the alteration or destruction of wetlands resulting from sedimentation following earth moving activities and the removal of contaminated sediments from streams. Stormwater runoff control measures, including erosion and sediment controls, would be installed, inspected, and maintained to prevent indirect impacts. Noise and human presence could also impact wildlife present within wetland areas, with impacts and mitigation measures similar to those addressed earlier for terrestrial species.

Direct impacts on wetlands would occur in connection with remediation of the Cesium Prong, where six delineated wetland areas (W31, W37, W38, W40, W44, and W45) totaling 2.1 hectares (5.1 acres) are located in and around WMAs 3, 4, and 5. Removal of the SDA would directly impact one jurisdictional wetland (W66) totaling 0.01 hectare (0.02 acre) and two isolated wetlands (W33 and W65) measuring 0.04 hectare (0.1 acre). Removal of the SDA also has the potential to impact the 30.5-meter (100-foot) buffer area around the New York State Freshwater Wetlands (W10 and W11) that borders the SDA to the east and south (see Appendix M, Figure M–6, of this EIS). Any work within the buffer would require a permit from the State. Additionally, five other wetland areas (W4 - W8) measuring a total of 0.7 hectare (1.8 acres) would be indirectly affected as a result of altered water levels and siltation during closure of the dams and reservoirs in WMA 12. The largest of these wetlands is located at the head end of the North Reservoir, while the other four smaller wetlands are located just downstream from the discharge point from the North Reservoir. Impacts to affected wildlife would be similar to those for terrestrial wildlife addressed earlier. Prior to the disturbance of any jurisdictional wetland, a Section 404 permit would be acquired from the U.S. Army Corps of Engineers, and in the case of a New York State Freshwater Wetland, a permit would be acquired from the Department of Environmental Conservation. Additionally, a mitigation plan would be developed which would fully address the compensation mechanism selected (i.e., compensatory mitigation, mitigation bank, or in-lieu fee mitigation) to mitigate wetland impacts (73 FR 19594). Best management practices, including erosion and sediment controls, would be implemented during all remediation work potentially affecting wetlands.

Aquatic Resources

Direct impacts on aquatic resources during construction and operation of new temporary facilities would not occur because no such resources are located within the construction sites. Indirect impacts would be limited because best management practices, including implementation of a soil erosion and sedimentation plan, would be followed.

Manmade aquatic features (i.e., lagoons, ponds, and reservoirs) would be directly impacted by decommissioning activities when lagoons and ponds are excavated and backfilled and dams and reservoirs are demolished and removed. The active lagoons contain wastewater or treated water. Periodically, treated wastewater from Lagoon 3 is discharged to Erdman Brook through an SPDES-permitted discharge. The reservoirs drain into Buttermilk Creek. Fish, amphibians, and reptiles associated with the ponds and reservoirs would be lost during implementation activities. The sunfish population would be especially affected, because it is the most common species observed in the North Reservoir and the only species seen in the South Reservoir. The dams and reservoirs would be closed in accordance with applicable Federal and State regulations and approvals from EPA, NYSDEC, and the New York State Department of Health. Specific requirements for fish management at the time of closure would be developed as part of the approval process.

Aquatic populations associated with site streams would also be affected during the removal of contaminated sediment in Quarry Creek, Erdman Creek, Franks Creek, Buttermilk Creek from its confluence with Franks Creek downstream to its confluence with Cattaraugus Creek, and the portion of Cattaraugus Creek near its confluence with Buttermilk Creek. This action would result in the direct loss of aquatic species and indirect loss due to downstream sedimentation. Additionally, the removal of vegetation along streambeds would increase stream temperatures, thereby altering ecosystem dynamics. Removal of soil from the 16.6 hectares (41 acres) of the Cesium Prong that are located outside of the disturbed portion of the site would directly impact Quarry Creek and several small ponds with the loss of associated aquatic species. Remediation of the Cesium Prong (and North Plateau Groundwater Plume) also has the potential to indirectly affect streams through erosion and sedimentation. Impacts to wildlife associated with ponds and stream channels would also occur as a result of remediation activities. Mitigation, including appropriate erosion controls, would be installed and best management practices would be implemented to minimize soil erosion and sedimentation. As with the dams and reservoirs, specific requirements for fish management would be developed as part of the approval process prior to any actions taking place.

Threatened and Endangered Species

No Federal or State threatened, endangered, or candidate species have been found to reside on the WNYNSC Site (see Chapter 3, Section 3.8.4), thus, there would be no impact to any listed species from the Sitewide Removal Alternative. Further, no critical habitat for any such species, nor critical environmental areas for State rare or endangered species are known to exist on the WNYNSC Site; therefore, none would be affected under the Sitewide Removal Alternative.

Under the Sitewide Removal Alternative, remediation work would involve the removal of sediment in Quarry Creek, Erdman Creek, Franks Creek, Buttermilk Creek from its confluence with Franks Creek downstream to its confluence with Cattaraugus Creek, and the portion of Cattaraugus Creek near its confluence with Buttermilk Creek. Due to the presence of the Appalachian tiger beetle (*Cicindela ancocisconensis*) (New York State rank: imperiled) in the vicinity of the confluence of Buttermilk and Cattaraugus Creeks, this work is likely to adversely impact local populations of this species. Also, the cobblestone tiger beetle (*Cicindela marginipennis*) (New York State rank: critically imperiled) is located downstream from the confluence of the two streams. Although this species would not be directly impacted under this alternative, careful implementation of the erosion and sediment control plan would be necessary to prevent indirect impacts. While neither species is legally protected, both should be fully considered during the planning and implementation phases should this alternative be selected.

4.1.6.2 Sitewide Close-In-Place Alternative

Similar to the Sitewide Removal Alternative, a number of new temporary facilities would be built to support decommissioning activities, and key site facilities would be closed in place. Site ponds, lagoons, and reservoirs would be taken out of service. No effort would be made to remediate contaminated streambed sediment or soils within the North Plateau Groundwater Plume or Cesium Prong.

Terrestrial Resources

Direct and indirect impacts from the construction of new temporary facilities to support decommissioning, including remediation activities, would be similar to those discussed for the Sitewide Removal Alternative in Section 4.1.6.1 of this chapter; however, the total affected area for these facilities would be 1.2 hectares (3 acres). Mitigation measures would also be similar to those described for the Sitewide Removal Alternative. As part of this alternative, a number of erosion control measures would be taken, including installation of water control structures and work in and adjacent to Quarry, Erdman, and Franks Creeks. These actions would disturb about 10.1 hectares (25 acres) of woodlands and fields, with impacts similar to the other ground-disturbing activities addressed in Section 4.1.6.1.

Decommissioning activities under this alternative would take place throughout WNYNSC, with the exception of WMAs 4, 10, and 11. In general, demolition of facilities would have minimal direct impact on terrestrial resources. Indirect impacts would be possible, however, and could include disturbance and displacement of wildlife due to noise and increased human presence (see Section 4.1.6.1). Both the NDA and SDA would receive a robust multi-layer cap under this alternative. These caps would offer little habitat for wildlife, as they would be rock covered. The areas would also be fenced, thus preventing use by larger mammals.

At the conclusion of decommissioning activities, as well as decay of the Cesium Prong (100 years) and nonsource areas of the North Plateau Groundwater Plume (200 years), much of the site (see Figure 4–1) would be available for release for unrestricted use. Regrading and revegetation of remediated areas would allow those areas to be used by wildlife.

While the North Plateau Groundwater Plume source area would be closed in an integrated manner with the Main Plant Process Building and other facilities, the nonsource area would be allowed to decay in place. Similarly, the Cesium Prong would be managed by implementing restrictions on use until in-place decay results in levels allowing for unrestricted use. Because activities would take place within disturbed areas of the WNYNSC Site, terrestrial resources would not be affected.

Wetlands

No wetlands would be affected during construction of new facilities, because none are present on the proposed building sites. However, construction of erosion control measures under this alternative would directly impact two jurisdictional wetlands (W34 and W39) totaling approximately 0.1 hectare (0.3 acre), while placement of the multi-layer cap over the NDA and SDA would directly impact three jurisdictional wetlands (W10, W11, [both also New York State Freshwater Wetlands] and W66) totaling 3.3 hectares (8.3 acres), and two isolated wetlands (W33 and W65) measuring 0.04 hectares (0.1 acres). The actual disturbance to the jurisdictional wetlands would be less than half of their total area. Impacts to these wetlands would be similar to those addressed in Appendix M, Section M.3.1.2, of this EIS. Additionally, placement of the multi-layer cap has the potential to cause indirect impacts (sedimentation) to those portions of the New York State wetlands not directly impacted. Placement of the multi-layer cap would impact the 100-foot (30.5-meter) buffer area around the New York State wetlands. Any work within the State wetlands (and buffer area) would require a permit from the State, as well as the U.S. Army Corps of Engineers. Mitigation measures such as those addressed in

Appendix M, Section M.4.2, and Chapter 6 of this EIS would be implemented to address direct and indirect impacts.

Similar to the Sitewide Removal Alternative, five wetland areas measuring 0.7 hectare (1.8 acres) could be affected during closure activities associated with the dams and reservoirs. Direct and indirect impacts resulting from remediation and closure activities, as well as mitigation requirements, would be similar to those addressed for the Sitewide Removal Alternative. Because the North Plateau Groundwater Plume and Cesium Prong would not involve removal of soils in nonsource areas, there would be no indirect impacts on wetlands in that area of the site.

Aquatic Resources

Under the Sitewide Close-In-Place Alternative, impacts to aquatic resources generally would be fewer than those under the Sitewide Removal Alternative. Thus, while streambeds and associated aquatic resources would be temporarily disturbed during the installation of erosion control features (see Section 4.1.6.1 of this chapter), streams would not be remediated through sediment removal. Because soil in nonsource areas of the North Plateau Groundwater Plume and Cesium Prong would not be disturbed under this alternative, there would be no direct or indirect impacts to ponds or streams from this activity. Also, although the reservoirs would be taken out of service, they would not be removed. This would leave intact the aquatic populations of these water bodies.

Threatened and Endangered Species

Similar to the Sitewide Removal Alternative, no Federal or State threatened or endangered species would be affected by any of the actions taken under the Sitewide Close-In-Place Alternative. Although there would be some temporary disturbance to streams during the placement of erosion control structures, implementation of the site soil erosion and sediment control plan would minimize potential indirect impacts to both the Appalachian tiger beetle and cobblestone tiger beetle.

Long-Term Impacts

To understand the potential for local adverse ecological impacts from the long-term releases of radionuclides at the site, a screening-level ecological risk assessment was performed that compared predicted concentrations against published DOE Biota Concentration Guides (BCGs), concentration limits for radionuclides to protect biota (DOE 2002d). BCGs are based on threshold doses for the protection of ecological receptors of 1 rad per day for aquatic biota and 0.1 rad per day for terrestrial animals. These dose limits meet the requirements of DOE Order 5400.5, "Radiation Protection of the Public and Environment" (DOE 1990a), and DOE Order 450.1A, "Environmental Protection Program" (DOE 2008d); and they equal the dose limits for protection of biota recommended by the National Council on Radiation Protection and Measurements and the International Atomic Energy Agency (DOE 2002d). BCGs are calculated using conservative exposure assumptions and parameter values and are thus "appropriately conservative limiting concentrations of radionuclides in environmental media (DOE 2002d)."

The Long-term Performance Assessment effort, which is described in Section 4.1.10, Long-term Human Health, and Appendix H of this EIS, projected radionuclide concentrations in surface water and in sediments along Buttermilk Creek below the confluence of Franks Creek and Buttermilk Creek as a result of groundwater and surface water transport processes. This location is at a central portion of the site and is exposed to contaminated water that is discharged to Franks Creek as well as contaminated water that enters Buttermilk Creek from seeps on the western bank upstream of the confluence with Franks Creek.

A screening analysis was conducted that compared predicted radionuclide concentrations in surface water and sediment in Buttermilk Creek against DOE BCGs for water and sediment that would be used by terrestrial animals and biota. The projected water concentrations were about 5 percent of the DOE screening-level concentration limits for aquatic biota and less than 0.02 percent of the screening-level concentrations for terrestrial animals. The projected sediment concentrations were less than 0.01 percent of the DOE screening-level concentration limits for aquatic biota and less than 0.3 percent of the screening-level concentrations for terrestrial animals. On the basis of this screening analysis, it is concluded that long-term releases from the Sitewide Close-In-Place Alternative (assuming no unmitigated erosion) would not result in long-term ecological consequences.

4.1.6.3 Phased Decisionmaking Alternative

Under Phase 1 of this alternative, some new temporary facilities would be built to support closure activities and key site facilities would be removed. This alternative would initially remove all North Plateau facilities, except for the Waste Tank Farm and its supporting facilities. Site ponds and lagoons would also be taken out of service; however, reservoirs would be maintained. No effort would be made to remediate contaminated streambed sediment or soils within the nonsource area of the North Plateau Groundwater Plume and Cesium Prong. Under Phase 2, actions could range from complete removal of all site facilities to partial removal as described under the Sitewide Close-In-Place Alternative.

Terrestrial Resources

Under Phase 1 of this alternative, direct and indirect impacts from the construction of new temporary facilities to support decommissioning, including remediation activities, would be similar to those discussed in Section 4.1.6.1 of this chapter; however, the total area impacted would be about 0.8 hectare (2 acres). Mitigation measures for new temporary facilities would also be similar to those described for the Sitewide Removal Alternative. Because the nonsource area of the North Plateau Groundwater Plume and Cesium Prong would not be remediated under Phase 1, but be allowed to decay in place, there would be no impact to terrestrial resources.

If Phase 2 activities follow those of the Sitewide Removal Alternative, impacts to terrestrial resources would be similar to those addressed in Section 4.1.6.1 of this chapter, with the major impact being the loss of 16.6 hectares (41 acres) of terrestrial habitat resulting from remediation of the Cesium Prong. If Phase 2 activities follow those of the Sitewide Close-In-Place Alternative, impacts would be similar to those addressed in Section 4.1.6.2. In this case, there would be no impacts from remediation of the Cesium Prong; however, 10.1 hectares (25 acres) of terrestrial habitat would be lost from construction of erosion control measures.

Wetlands

During Phase 1 of this alternative, no wetlands would be affected by construction of temporary facilities, because none are present on the proposed building sites. Further, remediation and closure activities planned under this alternative would not directly impact wetlands, because none are present in the associated WMAs. However, the removal of existing facilities could lead to indirect impacts to nearby wetlands as described for the Sitewide Removal Alternative. Mitigation requirements would be similar to those discussed for the Sitewide Removal Alternative. Because the nonsource area of the North Plateau Groundwater Plume and the Cesium Prong would not be remediated, but allowed to decay in place, there would be no impacts to wetlands in this area.

If during Phase 2 closure activities reflect those of the Sitewide Removal Alternative, impacts to wetlands would be similar to those addressed in Section 4.1.6.1 of this chapter. Thus, direct (2.8 hectares [7.0 acres]) and indirect impacts are possible and would result largely from the remediation of the North Plateau Groundwater Plume and Cesium Prong and removal of the North and South Reservoirs. If activities associated with Phase 2 follow the pattern of the Sitewide Close-In-Place Alternative, direct (1.8 hectares [4.4 acres]) and indirect impacts to wetlands would be similar to those addressed in Section 4.1.6.2. In this case, impacts would largely result from the installation of a number of erosion control measures and the placement of a multi-layer cap over the SDA.

Aquatic Resources

Under Phase 1 of this alternative, the only manmade aquatic features to be directly impacted would be a number of lagoons and the demineralizer sludge ponds which would be exhumed and backfilled. This would have a negligible impact on site aquatic resources. The dams and reservoirs in WMA 12 would remain and no action would be taken on contaminated stream sediments. Also, because soil in the nonsource area of the North Plateau Groundwater Plume and Cesium Prong would not be excavated, there would be no direct or indirect impacts to ponds or streams.

If Phase 2 activities reflect those of the Sitewide Removal Alternative, impacts to wetlands would be similar to those addressed in Section 4.1.6.1 of this chapter. Thus, impacts to aquatic resources would primarily be associated with remediation of the nonsource area North Plateau Groundwater Plume and Cesium Prong sediment removal in streams and closure of the reservoirs. If Phase 2 actions reflect those of the Sitewide Close-In-Place Alternative, fewer impacts to aquatic resources would occur because those activities noted earlier would not take place. However, streambeds and associated aquatic resources would be temporarily disturbed during the installation of erosion control features.

Threatened and Endangered Species

No Federal or State threatened or endangered species would be impacted by any of the actions taken under Phase 1 of this alternative. As noted for Aquatic Resources, soil disturbance, and hence the potential for stream sedimentation, would be minimized under this alternative because soil in the nonsource area of the North Plateau Groundwater Plume and Cesium Prong would not be excavated. Contaminated stream sediments would not be removed during Phase 1. These factors, plus the implementation of a site soil erosion and sediment control plan, would minimize potential indirect impacts to the Appalachian tiger beetle and cobblestone tiger beetle.

As is the case under Phase 1, Phase 2 of the Phased Decisionmaking Alternative would not impact any Federal or state threatened or endangered species. However, if Phase 2 activities reflect those of the Sitewide Removal Alternative, impacts from stream remediation activities on the Appalachian tiger beetle and cobblestone tiger beetle would be similar to those addressed in Section 4.1.6.1 of this chapter. If Phase 2 activities are similar to those undertaken under the Sitewide Close-In-Place Alternative, potential impacts to these two species would be minimized through the implementation of the site erosion and the sediment control plan (see Section 4.1.6.2).

4.1.6.4 No Action Alternative

Under the No Action Alternative, no decommissioning actions would be taken. Once deactivation activities were completed, a portion of the site (1,713 hectares [693 acres]) could be released, while remaining portions would continue to be monitored and maintained as required by Federal and State regulations. There would be no decommissioning impacts on terrestrial resources, wetlands, aquatic resources, or threatened and endangered species under this alternative.

Long-Term Impacts

As described in Section 4.1.6.2 of this chapter, a screening-level ecological risk assessment was performed to understand the potential for local adverse ecological impacts from long-term releases of radionuclides at the site. The screening analysis compared predicted radionuclide concentrations of surface water and sediment against DOE BCGs for terrestrial animals and aquatic biota. As noted in Section 4.1.6.2, the predicted concentrations were a few percent of the DOE screening-level concentration limits. On the basis of this screening analysis, it was concluded that long-term releases from the No Action Alternative (assuming no unmitigated erosion) would not result in long-term ecological consequences.

4.1.7 Cultural Resources

Cultural resources include prehistoric, historic, and traditional cultural properties. Prehistoric resources are physical remains of human activities that predate written records. They generally consist of artifacts that may alone or collectively yield information about the past. Historic resources consist of physical properties that postdate the emergence of written records. In the United States, they are architectural structures or districts, archaeological objects or archaeological features dating from 1492 and later. Ordinarily, sites less than 50 years old are not considered historic, but exceptions can be made for such properties if they are of particular importance, such as structures associated with World War II or Cold War themes. Traditional cultural properties include sites, areas, and materials that have a cultural significance to American Indians and other ethnic groups. A traditional cultural property is associated with cultural practices or beliefs that are rooted in history and are important in maintaining the continuing cultural identity of the community for religious or heritage-related reasons. Such resources may include geographic features, plants, animals, cemeteries, battlefields, trails, or sacred/ceremonial sites.

Decommissioning activities are not likely to have an impact on prehistoric resources, historic resources, or traditional cultural properties in or near WNYNSC. The analysis of potential impacts on cultural resources for each alternative is summarized in **Table 4–10**.

To determine whether cultural resources were present, previous surveys of facility locations were examined. Potential indirect impacts include those associated with reduced access to a resource site, as well as impacts associated with increased traffic and visitation to sensitive areas. Direct impacts include those resulting from ground-disturbing activities associated with demolition, construction, and operations. Avoidance of identified cultural resources would be a primary goal wherever practical. To avoid loss of cultural resources during construction, cultural resource surveys would be conducted in the area of interest. Although no alternative is expected to affect significant cultural resources, the potential for inadvertent discovery of prehistoric or archaeological resources exists, especially in those areas that are not presently disturbed. Consultations to comply with Section 106 of the National Historic Preservation Act were conducted with the New York State Office of Parks, Recreation and Historic Preservation. Correspondence offering consultation was sent to the Seneca Nation of Indians (see Appendix O of this EIS). There will be ongoing correspondence with the Seneca Nation of Indians to discuss any issues or concerns that arise.

Table 4–10 Cultural Resources Impacts

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Prehistoric	None expected; lack of existing prehistoric resources on site. This alternative would have a greater potential for impact due to land disturbance and the possibility of unearthing archaeological resources. If prehistoric resources are found, they would most likely be in areas that are not presently developed.	None expected; lack of existing prehistoric resources on site. If prehistoric resources are found, they would most likely be in areas that are not presently developed.	None expected for Phase 1; lack of existing prehistoric resources on site. If Phase 2 involves removal activities, there would be greater potential for land disturbance or the possibility of unearthing archaeological resources. If prehistoric resources are found, they would most likely be in areas that are not presently developed.	None expected; lack of existing prehistoric resources on site.
Historic	None expected; no sites of historical significance were identified on site in previous surveys. This alternative would have a greater potential for impact due to the land disturbance and the possibility of unearthing archaeological resources. If historic resources are found, they would most likely be in areas that are not presently developed.	None expected; no sites of historical significance were identified on site in previous surveys. If historic resources are found, they would most likely be in areas that are not presently developed.	None expected for Phase 1; no sites of historical significance were identified on site in previous surveys. If Phase 2 involves removal activities, there could be greater potential for impact due to land disturbance and the possibility of unearthing archaeological resources. If historic resources are found, they would most likely be in areas that are not presently developed.	None expected; no sites of historical significance were identified on site in previous surveys.
Traditional Cultural Properties	None expected; decommissioning activities would occur in previously disturbed areas or areas lacking traditional cultural properties. Ongoing consultation with the Seneca Nation of Indians regarding possible impacts. This alternative would have a greater potential for impact due to the land disturbance and the possibility of unearthing archaeological resources. If traditional cultural properties are found, they would most likely be in areas that are not presently developed.	None expected; decommissioning activities would occur in previously disturbed areas or areas lacking traditional cultural properties. Ongoing consultation with the Seneca Nation of Indians regarding possible impacts. If traditional cultural properties are found, they would most likely be in areas that are not presently developed.	None expected for Phase 1; decommissioning activities would occur in previously disturbed areas or areas lacking traditional cultural properties. If Phase 2 involves close-in-place activities, no impacts would be expected. If Phase 2 involves removal activities, there could be greater potential for impact due to land disturbance and the possibility of unearthing archaeological resources. If traditional cultural resources are found, they would most likely be in areas that are not presently developed. Ongoing consultation with the Seneca Nation of Indians regarding possible impacts.	None expected; mitigation measures would be implemented as needed following the failure of a structure, system, or component. Ongoing consultation with the Seneca Nation of Indians regarding possible impacts.

4.1.7.1 Sitewide Removal Alternative

Prehistoric Resources

Under the Sitewide Removal Alternative, all facilities would be removed and the entire WNYNSC would be available for release for unrestricted use (except for optional temporary operation of Container Management Facility). About 16.6 hectares (41 acres) of previously undisturbed land would be affected by remediating the Cesium Prong. If prehistoric resources are found, they would most likely be in areas that are not presently developed. No adverse impacts to prehistoric resources would be expected because the activities under this alternative would primarily occur in previously disturbed areas (WSMS 2008a). There has only been one prehistoric lithic findspot on the WNYNSC Site, which was considered a stray find (WVNS 1994b) (see Chapter 3, Section 3.9.1, of this EIS). No other cultural material or cultural features were observed during additional shovel test pits. If additional prehistoric resources were uncovered during demolition or construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

Historic Resources

Under this alternative, impacts to potential historic resources associated with natural stream channels would be greatest during removal of trees and vegetation along Erdman Brook to allow access for the heavy excavation equipment. About 16.6 hectares (41 acres) of previously undisturbed land would be affected by remediating the Cesium Prong. If historic resources are found, they would most likely be in areas that are not presently developed. The possibility to unearth previously undetected sites is greater near the banks of streams and rivers, where previous inhabitants tended to establish settlements. Increased human presence and vehicular traffic would also contribute to the disturbance. Of the 10 historic sites and structures identified during cultural resource surveys (see Chapter 3, Section 3.9.2, of this EIS), none has been determined eligible for inclusion in the National Register of Historic Places (SHPO 1995, DOE 2006c). If potential historic resources are found during demolition or construction, additional investigations may be required. Consultation with the State Historic Preservation Officer would be undertaken, as necessary, in order to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places, and, if appropriate, data and artifact recovery would be conducted. Further mitigation measures would be developed and implemented should such a discovery occur.

Traditional Cultural Properties

Under the Sitewide Removal Alternative, most activities would occur within previously disturbed areas contained within or adjacent to developed areas. About 16.6 hectares (41 acres) of previously undisturbed land would be affected by remediating the Cesium Prong. If traditional cultural properties are found, they would most likely be in areas that are not presently developed. The likelihood that these areas contain cultural materials intact or in their original context is small, as indicated by the results of cultural resources studies discussed in Chapter 3, Section 3.9.3, of this EIS.

Under this alternative, the reservoirs in WMA 12 would be drained slowly and in accordance with applicable Federal and State regulations and approvals from NYSDEC, the New York State Department of Health, and EPA. The reservoirs drain into Buttermilk Creek, which flows into Cattaraugus Creek. As noted in Chapter 3, Section 3.9.3, Cattaraugus Creek, located downstream approximately 24 kilometers (15 miles) from WNYNSC, holds great cultural and economic significance to the Seneca Nation of Indians (Snyder 1993). Because decommissioning activities that could adversely impact Cattaraugus Creek and potential traditional cultural resources would be accomplished in a controlled manner, no impacts are expected (WSMS 2008a). As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any potential impacts as a result of implementing this alternative.

4.1.7.2 Sitewide Close-In-Place Alternative

Prehistoric Resources

Under this alternative, key facilities would be closed in place. Other areas would be isolated and could remain under license or permit for the foreseeable future. About 10.1 hectares (25 acres) of previously undisturbed land would be affected by installation of erosion control features. If prehistoric resources are found, they would most likely be in areas that are not presently developed. As for the Sitewide Removal Alternative, due to the absence of prehistoric finds in the area, no impacts to prehistoric resources would be expected (the only artifact recovered from surveys of this area is considered to be a "stray find" because it was isolated and not found in association with other prehistoric cultural material or features). If additional prehistoric resources were uncovered, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

Historic Resources

As noted for the Sitewide Removal Alternative, no historic sites or structures that are eligible for the inclusion in the National Register of Historic Places have been identified during cultural resource surveys at the WNYNSC Site. About 10.1 hectares (25 acres) of previously undisturbed land would be affected by erosion control features. If historic resources are found, they would most likely be in areas that are not presently disturbed. Although the majority of activities for the Sitewide Close-In-Place Alternative would occur within previously disturbed areas contained within or adjacent to developed areas, there is always the potential to unearth or expose cultural material during excavation. If historic resources were found, consultation with the State Historic Preservation Officer would be undertaken, as necessary, to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places and, if appropriate, data and artifact recovery would be conducted. Further, mitigation measures would be developed and implemented should such a discovery occur.

Traditional Cultural Properties

Under this alternative, most activities would occur within previously disturbed areas contained within or adjacent to developed areas. Approximately 10.1 hectares (25 acres) of previously undisturbed land would be affected by installation of erosion control features. If traditional cultural properties are found, they would most likely be in areas that are not presently developed. Decommissioning activities that could adversely impact Cattaraugus Creek and potential traditional cultural properties would be accomplished in a controlled manner and impacts would be minimal (WSMS 2008b). As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any potential impacts as a result of implementing this alternative.

4.1.7.3 Phased Decisionmaking Alternative

Prehistoric Resources

Under this alternative, decommissioning would be conducted in two phases. Phase 1 would initiate the decommissioning process for parts of WVDP, and Phase 2 would complete the decommissioning or long-term management process for the balance of WVDP and WNYNSC. No impacts on prehistoric resources are expected for this alternative. As stated for the previous alternatives, no significant prehistoric finds were discovered during previous surveys, although similar to that for the Sitewide Removal Alternative, there would be a greater potential for impact if Phase 2 activities involve disturbances of previously undeveloped land. If additional prehistoric resources were uncovered during construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

Historic Resources

For both phases of the Phased Decisionmaking Alternative, impacts on historic resources would be similar to those stated for the previous alternatives. The existing historic sites and structures identified in previous surveys were not determined to have cultural significance. If historic resources were found, consultation with the State Historic Preservation Officer would be undertaken, as necessary, to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places, and, if appropriate, data and artifact recovery would be conducted. Further, mitigation measures would be developed and implemented should such a discovery occur.

Traditional Cultural Properties

It is not expected that either phase of the Phased Decisionmaking Alternative would have any impacts on traditional cultural properties. As is the case for the other alternatives, most decommissioning activities would occur within previously disturbed areas contained within or adjacent to developed areas. As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any potential impacts as a result of implementing this alternative.

4.1.7.4 No Action Alternative

Prehistoric Resources

No actions toward decommissioning would be taken. No impacts on prehistoric resources would be expected because no additional disturbances to previously undisturbed areas of the site are planned.

Historic Resources

No impacts on historic resources would be expected because no additional disturbances to previously undisturbed areas of the site are planned.

Traditional Cultural Properties

Existing impacts on traditional cultural properties would continue. Mitigation measures would be implemented as needed following the replacement or refurbishment of a structure, system, or component (WSMS 2008d). As appropriate, DOE would coordinate with the Seneca Nation of Indians to address any potential impacts as a result of implementing this alternative.

4.1.8 Socioeconomics

Socioeconomic impacts are the result of changes to the demographic, economic, and social conditions of a region. The major measure in this analysis is the change in the number of jobs in the affected region. Jobs are characterized by two types: (1) construction-related jobs, which are transient in nature and short in duration, and thus less likely to have a longer term socioeconomic impact; and (2) operations-related jobs in support of facility operations, which are required for a longer period of time, and thus have a greater potential for permanent socioeconomic impacts in the region.

Potential economic impacts include the effects on employment, earnings, and output. Because earnings and output are a derivation of employment, this analysis focuses on employment impacts. **Table 4–11** lists the potential employment impacts estimated under each alternative. To provide a backdrop to realize the scale of the impacts, the average annual employment associated with the implementation of each alternative was compared to the projected regional labor force during the final year of decommissioning activities. Potential social and demographic impacts as a result of changes in employment and economic activity are discussed in this section.

Table 4–11 Summary of Socioeconomic Impacts

Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Decommissioning Action Employment Levels	Greatest potential for socioeconomic impacts (average 260 employees) over the longest duration of decommissioning actions (64 years) for any alternative. Employment levels would be a small fraction of regional employment, so there would be no discernible impact on socioeconomic infrastructure. Eventual reduction in employment is known and should be manageable.	Moderate potential for socioeconomic impacts (average 300 employees) over duration of decommissioning actions (7 years). Employment levels would be a small fraction of regional employment, so there would be no discernible impact on socioeconomic infrastructure. Eventual reduction in employment is known and should be manageable.	Moderate potential for socioeconomic impacts (average 230 employees) over duration of decommissioning actions (8 years). Additional employment could follow from the Phase 2 decision, depending on decisions on actions to be taken. If the Phase 2 decision is removal of remaining facilities and contamination, employment levels (in worker years) for this alternative would be similar to the Sitewide Removal Alternative; if the Phase 2 decision is close-in-place, the employment levels (in worker-years) would be higher than the Sitewide Close-In-Place Alternative. Employment levels would be a small fraction of regional employment, so there would be no discernible impact on socioeconomic infrastructure. Eventual reduction in employment is known and should be manageable.	No decommissioning action employment.
Monitoring and Maintenance Employment Levels	None, assuming no need for onsite management of orphan waste.	About 30 employees until Interim Storage Facility is removed in year 33, and then 18 employees.	About 50 employees until the Interim Storage Facility is removed in year 30. Longer term employment depends on Phase 2 decisions.	About 75 employees, including the effective annual level for routine replacement activities.

Based on the expected changes in employment levels, the impact to economic conditions currently experienced within the WNYNSC region would be small. For the purposes of comparison, as of 2007, there were nearly 483,000 individuals employed in the two-county ROI (444,000 in Erie and 39,000 in Cattaraugus) (NYSDOL 2008b). The largest impact would be associated with implementing the Sitewide Removal Alternative, because this alternative would have the long-lasting, elevated worker requirement that would put the most money into the local economy. No change would be expected in regional unemployment rates because the average requirements for additional workers at the site to support closure activities would be a very small percentage of workers in the region, and, more importantly, much of the work would be accomplished over relatively short periods of time by subcontractors hired to accomplish specific demolition or cleanup tasks. The businesses that accomplish these efforts typically work on jobs for set periods of time and then move on to other jobs, so it is not expected that the need for additional workers at the site would result in an influx of workers into the area during implementation of any of the alternatives. In some cases, personnel who may be losing permanent positions as activities are closed on site might transition to cleanup-related activities. There would eventually be a loss of employment at the site as a result of implementing the alternatives, but these losses would be known in advance and planning should allow the community to absorb the relatively small number of workers without unduly stressing existing support programs.

There would be no appreciable impact to the demographic characteristics of the WNYNSC region. The in-migration of workers, if any, to support the decommissioning or long-term management operations at WNYNSC under any of the alternatives would be small. Likewise, there would be no appreciable change in the current availability of housing and/or demand for community services within the WNYNSC region.

During implementation of the Sitewide Removal, Sitewide Close-In-Place, or Phased Decisionmaking (Phase 1) Alternatives, additional funds would flow into the local economy as a result of increased spending to support decommissioning activities. About $100 million (2008 dollars) of project funding is estimated to be spent annually implementing the decommissioning actions for these three alternatives (WSMS 2008e), although a large fraction of these funds would go toward shipping waste off site for alternatives that involve removal, and the full benefit of these funds would not necessarily flow into the local economy.

4.1.8.1 Sitewide Removal Alternative

An average annual workforce of about 260 would be required throughout the 64-year implementation of this alternative, which would result in the highest number of worker-years of any of the decommissioning alternatives. Resulting indirect employment is expected to average about 280 workers. Peak staffing of approximately 310 is estimated to occur around year 11. The lowest staffing levels would be required during the last year of the decommissioning actions, when approximately 50 individuals would be needed during the final stages of excavation of the North Plateau Groundwater Plume (WSMS 2008a). Construction employment is estimated to peak at about 140 workers around year 3. The average total employment that can be attributed to implementing this alternative is estimated to be approximately 0.11 percent of the projected regional labor force during the final year of the implementation phase. Assuming no orphan waste has to be managed on site, no long-term monitoring staff would be required because the site would meet all the criteria for unrestricted release. If orphan waste must be managed on site, operations would cost approximately $3.7 million annually (WSMS 2008a) and require a staff of approximately 20 workers.

The level of employment associated with the Sitewide Removal Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Similarly, at the end of the project the additional land available for release for unrestricted use is not expected to spur development or other growth-inducing factors.

4.1.8.2 Sitewide Close-In-Place Alternative

The average annual staffing requirements during the 7-year decommissioning period would be about 300 workers, which would result in a lower number of worker-years than the Sitewide Removal Alternative. The average indirect employment generated under this alternative is estimated at about 320 workers. Peak employment of about 350 workers is estimated to occur around year 3. Construction employment is estimated to peak at about 80 workers around year 7. The average total employment for implementing this alternative would be approximately 0.12 percent of the projected ROI labor force during the final year of decommissioning actions. Operation of the Interim Storage Facility is estimated to continue until about year 32, when the vitrified canisters would be removed to the Federal Repository. The Interim Storage Facility would be demolished the following year. During the extended monitoring period, site personnel would perform routine monitoring, maintenance, and systems replacement activities, including replacement of the North Plateau permeable reactive wall every 20 years (WSMS 2008b).

The level of employment associated with the Sitewide Close-In-Place Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Similarly, at the end of the project the additional land available for release for unrestricted use is not expected to spur development or other growth-inducing factors.

4.1.8.3 Phased Decisionmaking Alternative

During Phase 1 of this alternative, estimated annual staffing would average approximately 230 workers. The peak requirement of 290 workers would occur approximately in year 4. The average indirect employment during Phase 1 is estimated at about 250 workers. Phase 1 decommissioning actions would be completed by year 8, but monitoring and maintenance activities would continue while onsite studies are conducted and the Interim Storage Facility is operational. Employment during this time would be about 50 workers. The Interim Storage Facility would operate until approximately year 30, when it would be demolished. The average total employment due to activities at WVDP during Phase 1 under this alternative is estimated to be 0.09 percent of the projected ROI labor force during the final year of Phase 1. Construction-related employment would peak at around 30 workers in the early years of this alternative during construction of the Interim Storage Facility and removal of the Main Plant Process Building and lagoons (WSMS 2008c).

If removal of the remaining facilities were selected for Phase 2 of this alternative, the employment levels and related socioeconomic impacts for the entire Phased Decisionmaking Alternative would be similar to those described for the Sitewide Removal Alternative. If in-place closure was selected for Phase 2, employment levels for the Phased Decisionmaking Alternative would be equal to or slightly less than the impacts described for the Sitewide Close-In-Place Alternative.

The level of employment associated with the Phased Decisionmaking Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Similarly, at the end of Phase 2 the additional land that may be available for release for unrestricted use is not expected to spur development or other growth-inducing factors.

4.1.8.4 No Action Alternative

Approximately 75 full-time-equivalent personnel would be required to monitor and maintain the WNYNSC Site. These personnel would include operations personnel who would provide full-time staffing of the site (i.e., 24 hours a day, 7 days a week). Also included would be engineering and maintenance personnel, as well as personnel within the various support organizations, including Quality Assurance, Industrial Hygiene and Safety, Purchasing, Financial, Environmental Affairs, Computer Support, Human Resources, Analytical Labs, and Security, as well as personnel expected to be required every 20 to 25 years to replace roofs, the SDA cap, and the NDA cap, and the permeable treatment wall (WSMS 2008d). The average indirect employment is estimated at about 80 workers. The average annual total employment attributed to the No Action Alternative is estimated to be 0.03 percent or less of the projected ROI labor force.

The level of employment associated with the No Action Alternative is a very small percentage of the projected regional labor force and would not be considered a notable growth-inducing economic driver. Similarly, the land available for release for unrestricted use is not expected to spur development or other growth-inducing factors.

4.1.9 Human Health and Safety During Decommissioning Activities

Actions to implement decommissioning would result in releases of radioactive materials to the atmosphere and to local surface waters. These releases would result in radiation doses and the risk of latent cancer fatalities (LCFs) to offsite individuals and populations, as well as occupational exposure to site workers. Accidents during decommissioning actions could result in doses to offsite individuals. Because fatal cancer is the most serious effect of environmental and occupational radiation exposures, estimates of cancer fatalities, rather than cancer incidence, are presented in this section. These effects are referred to as "latent" cancer fatalities because the cancer may take many years to develop. The numbers of fatal cancers can be used to compare the risks among the various alternatives.[9] A more detailed discussion of LCFs is presented in Appendix I, Section I.3, of this EIS. (Note that cancer incidence (latent cancer morbidity) is analyzed in Section 4.1.10, Long-term Human Health, to enable comparison of the projected long-term impacts for the EIS alternatives with the CERCLA risk range.)

Section 4.1.9.1 provides incident-free radiological impacts, while Section 4.1.9.2 presents accident-related radiological and chemical impacts. **Table 4–12** presents a comparison of the impacts under normal operations and accidents.

4.1.9.1 Incident-free Radiological Impacts

Population

The Sitewide Removal, Sitewide Close-In-Place, and Phase 1 of the Phased Decisionmaking Alternatives would each have controlled releases of radionuclides to the atmosphere and surface streams during decommissioning.

While there would be no decommissioning actions under the No Action Alternative, ongoing releases to the atmosphere and surface water would occur. Because some removal activities would occur during Phase 1, the total population dose for Phase 1 and 2 of the Phased Decisionmaking Alternative would be greater than that for the Sitewide Close-In-Place Alternative and approximately the same as that for the Sitewide Removal Alternative.

Controlled releases to air and water during decommissioning actions would result in doses to the surrounding general population. The releases are presented in terms of a peak annual population dose and a total population dose. Peak annual dose is the largest dose expected for any of the years during decommissioning operations for each alternative. The population dose for air releases is based on the dose to 1.7 million people who live within 80 kilometers (50 miles) of the site. The population dose for liquid releases is based on the dose to the population served by two water treatment systems that are within 80 kilometers (50 miles) of WNYNSC. Liquid releases flow off site via permitted outfalls into Cattaraugus Creek and ultimately into Lake Erie and the Niagara River, where they could enter into several water treatment plants. These water treatment plants serve 951,000 individuals. The drinking water dose analysis conservatively assumes no radionuclide removal in the water treatment system. In addition, the potential exists for a population dose from the consumption of fish raised in Lake Erie. Fish yields from northern Lake Erie were used to establish an estimate of the amount of contaminated fish that might be consumed. This dose was added to the population dose for the Lake Erie and Niagara River water users. The GENII Version 2 computer model (PNNL 2007) was used to estimate the radiological impacts of accident-free decommissioning operations. Discussion of the model and its application, along with results, is presented in Appendix I, Section I.4, of this EIS.

In addition, there could be long-term groundwater releases and potential erosion releases for all of the alternatives except the Sitewide Removal Alternative, which involves removal of potential source of releases. The potential for long-term releases for the Phased Decisionmaking Alternative is not currently quantitatively evaluated, because analysis of Phase 2 of this alternative would be performed after further characterization as

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[9] The risk factor of 0.0006 fatal cancers per rem (DOE 2002f) was used as the conversion factor for all radiological exposures due to accidents. For incident-free decommissioning operations resulting in radiological exposure, lifetime fatal cancer risk was calculated using radionuclide-specific risk factors.

part of Phase 1 activities. Phase 2 long-term releases would be no greater than those for the other alternatives. The long-term releases are addressed in Section 4.1.10, Long-term Human Health, of this chapter.

Table 4–12 Summary of Health and Safety Impacts

Environmental Resource	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Total Public Population Dose	Total public population dose from decommissioning actions over 64 years would be approximately 72.5 person-rem and 0.000028 person-rem when the Interim Storage Facility is demolished. No public population dose would occur in the region following decommissioning actions, even if orphan waste were stored pending offsite disposal.	Total public population dose from decommissioning actions over 7 years would be approximately 26.7 person-rem. There would be a small additional annual dose of 0.00045 person-rem coincident with North Plateau Groundwater Plume permeable treatment wall replacement and 0.000028 person-rem when the Interim Storage Facility is demolished.	Total public population dose from the Phase 1 decommissioning actions over 8 years would be approximately 42.1 person-rem. There would be a small additional annual dose of 0.0045 person-rem coincident with North Plateau Groundwater Plume permeable treatment wall replacement. There would be an additional public population dose for the Phase 2 actions, which have not been defined at this time. Depending on the decision for Phase 2 closure or removal, the Phase 2 dose would be no greater than that for the Sitewide Close-In-Place Alternative or that for the Sitewide Removal Alternative.	There would be no decommissioning actions. There would be a recurring annual population dose of 0.0766 person-rem per year as WNYNSC is monitored and maintained for the foreseeable future. This annual population dose would gradually decrease with time as the inventory decays.
Peak Annual MEI Dose	The peak annual dose to the MEI would be 0.26 millirem, due to releases to the atmosphere during decommissioning actions.	The peak annual dose to the MEI would be 0.14 millirem, due to liquid releases during decommissioning actions.	The peak annual dose to the MEI would be 0.84 millirem, due to releases to the atmosphere during decommissioning actions. Depending on the decision for Phase 2 (i.e., Sitewide Close-In-Place Alternative or Sitewide Removal Alternative), the Phase 2 dose would be no greater than that for the Sitewide Close-In-Place Alternative or the Sitewide Removal Alternative.	The peak annual dose to the MEI would be 0.61 millirem, due to recurring liquid releases as the facilities are being monitored and maintained.
Total Occupational Exposure	Total worker population dose from decommissioning actions over 64 years is estimated to be approximately 1,100 person-rem. A recurring worker exposure of about 0.15 person-rem per year would occur following decommissioning actions if orphan waste is stored on site pending offsite disposal.	Total worker population dose from decommissioning actions over 7 years is estimated to be approximately 130 person-rem. A recurring worker exposure of about 0.2 person-rem per year would occur as part of monitoring and maintenance activities.	Total worker population dose from Phase 1 decommissioning actions over 8 years is estimated to be approximately 140 person-rem. There would be additional occupational exposures for Phase 1 actions following decommissioning of 2.0 person-rem per year. If the Sitewide Close-In-Place Alternative is chosen for Phase 2, the total worker dose for Phase 2 would be 95.5 person-rem. If the Sitewide Removal Alternative is chosen for Phase 2, the total worker dose for Phase 2 would be 914 person-rem. The total worker dose for Phase 1 and Phase 2 would be 236 person-rem if in-place closure is chosen for Phase 2, and 1,050 person-rem if removal is chosen for Phase 2.	There are no decommissioning actions. A recurring worker exposure of approximately 2.6 person-rem per year would occur as part of monitoring and maintenance activities. No orphan or legacy waste would be stored on site.
Potential Accidents – Relative Risk to the Population and MEI	Highest [a]	Low [a]	Low [a, b]	Lowest [a]

Table 4–13 summarizes the projected total population dose to the general population and the risk associated with this dose in terms of additional LCFs for each of the alternatives as a result of decommissioning actions. The projected dose to the general population for the decommissioning alternatives ranges from 26.7 to 72.5 person-rem. These doses would be expected to result in less than 1 (0.0056 to 0.018) additional LCF within the affected population. In other words, no additional LCFs would be expected in the population as a result of decommissioning actions.

Table 4–13 Total Population Doses and Risk from Decommissioning Actions

Medium	*Sitewide Removal Alternative (over 64 years)*		*Sitewide Close-In-Place Alternative (over 7 years)*		*Phased Decisionmaking Alternative – Phase 1 (over 8 years)* [a]		*No Action Alternative*	
	Dose (person-rem)	*Risk (LCFs)*	*Dose (person-rem)*	*Risk (LCFs)*	*Dose (person-rem)*	*Risk (LCFs)*	*Dose (person-rem)*	*Risk (LCFs)*
Air Releases	39	0.0058	2.3	0.00051	42	0.0056	0	0
Liquid Releases	33.5	0.012	24.4	0.0088	0.1	0.000038	0	0
Total	72.5	0.018	26.7	0.0093	42.1	0.0056	0	0

LCF = latent cancer fatality.
[a] Phase 2 doses would be no greater than the Sitewide Removal Alternative or Sitewide Close-In-Place Alternative doses if one of these actions is selected.
Note: Totals may not add due to rounding.

In addition to the total population dose, an estimate of the peak annual dose to the general population from the decommissioning actions for each of the decommissioning alternatives is presented in **Table 4–14**. The peak annual dose represents the highest expected annual dose to the members of general population for a given alternative. It is a function of the rate at which specific decommissioning activities occur. The peak annual dose to the general population would range from 2.5 to 23 person-rem, depending on the alternative.

Table 4–14 Peak Annual Population Dose from Decommissioning Actions (person-rem per year)

Medium	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative – Phase 1* [a]	*No Action Alternative*
Air Releases	1.8	0.72	9.7	0
Liquid Releases	0.68	22	0.004	0
Total	2.5	23	9.7	0

[a] Phase 2 doses would be no greater than the Sitewide Removal Alternative or Sitewide Close-In-Place Alternative doses if one of these actions is selected.
Note: Totals may not add due to rounding.

After completion of the decommissioning actions for the decommissioning alternatives, there are expected to be minimal atmospheric or water releases and thus, negligible population doses. The exception would be the maintenance actions for as needed replacement of the permeable treatment wall and the removal of the Interim Storage Facility for the Sitewide Close-In-Place Alternative and Phase 1 of the Phased Decisionmaking Alternative. The annual population doses due to releases after completion of the decommissioning actions are presented in **Table 4–15**. The doses shown for the Sitewide Close-In-Place and the Phased Decisionmaking (Phase 1) Alternatives are peaks that are projected to occur during years when the permeable treatment wall maintenance actions would take place; the doses for the No Action Alternative apply to every year.

Peak annual population doses following decommissioning for Phase 1 of the Phased Decisionmaking Alternative are projected to be larger than those for the Sitewide Close-In-Place Alternative. The peak dose is projected to occur only once (if at all) during Phase 1 activities, but would occur periodically for the Sitewide Close-In-Place Alternative. Peak annual population doses are larger for Phase 1 because in addition to those associated with permeable treatment wall replacement, releases to air and water (and therefore population doses) are conservatively projected from WMAs that were not removed or closed in place during Phase 1 actions.

Table 4–15 Population Dose Following Completion of Decommissioning Actions (person-rem per year)

Medium	*Sitewide Removal Alternative* [a]	*Sitewide Close-In-Place Alternative* [b]	*Phased Decisionmaking Alternative – Phase 1* [c]	*No Action Alternative* [d]
Air Releases	Negligible	0.00045	0.0015	0.004
Liquid Releases	Negligible	0.0	0.003	0.0762
Total	Negligible	0.00045	0.0045	0.0766

[a] No releases are expected, even if orphan waste is stored.
[b] Doses are peak annual doses coincident with periodic replacement of the permeable treatment wall (every 20 years, if necessary). Demolition of the Interim Storage Facility is projected to cause a one-time annual population dose of 0.000028 person-rem.
[c] Doses are peak annual doses coincident with one-time replacement of the permeable treatment wall, if necessary, and include dose conservatively projected from releases from WMAs that are not removed or closed-in-place during Phase 1 actions. Doses associated with demolition of the Interim Storage Facility would be similar to those for the Sitewide Close-In-Place Alternative. Annual population doses from the Phased Decisionmaking Alternative during Phase 2 decommissioning actions cannot be analyzed until a decision is made on Phase 2 actions. Phase 2 doses would be no greater than the Sitewide Removal Alternative or Sitewide Close-In-Place Alternative doses if one of these actions is selected.
[d] Based on releases associated with continued operation of the existing ventilation and wastewater treatment systems.
Note: Totals may not add due to rounding.

Maximally Exposed Individual

This section analyzes the dose to the maximally exposed individual (MEI) from decommissioning actions. The MEI dose is the largest dose expected for any one individual member of the public whether from air emissions or liquid emissions. The releases to the atmosphere and to surface water result in impacts in different locations. For this reason, the following discussion addresses three receptors, any one of whom could be the MEI. One MEI is assumed to be at the site boundary for maximum exposure to air emissions, while other MEIs are located downstream for maximum liquid exposure.

For air releases, the individual who would receive the highest dose is located about 1.3 kilometers (0.8 miles) north-northwest of the Main Plant Process Building because of close distance and meteorological conditions. It is conservatively assumed that all the food (fruit, vegetables, and meat) consumed by this individual is raised near his or her residence. This individual is also assumed to spend time outside, so he is directly exposed to the atmospheric releases. For liquid releases, two individuals are analyzed, either of which could be the MEI, depending on the radionuclides released. The first is an individual assumed to be along Cattaraugus Creek downstream of the confluence with Buttermilk Creek, which is located about 5.6 kilometers (3.5 miles) downstream of the Main Plant Process Building. It is assumed that this individual uses untreated Cattaraugus Creek water for drinking and crop irrigation and consumes approximately 9 kilograms (20 pounds) of fish per year that is raised in Cattaraugus Creek near the confluence with Buttermilk Creek. The second individual who could be the MEI for liquid releases would be a receptor on the lower reaches of Cattaraugus Creek, located about 28.2 kilometers (17.5 miles) downstream from the site, who consumes a very large amount of locally raised fish annually (62 kilograms per year [137 pounds per year]) and uses untreated Cattaraugus Creek water for drinking and crop irrigation. A member of the Seneca Nation of Indians could be such a receptor. An individual at the site boundary would not be impacted by liquid releases because the closest liquid pathway is Buttermilk Creek, which is not located at the closest site boundary.

The projected doses to the three MEI receptors for each of the decommissioning alternatives are presented in **Table 4–16**. These dose calculations are based on the assumption that the MEI remains at the exposure point for the duration of the decommissioning actions. In the case of the Sitewide Removal Alternative, this would be 64 years; for the Sitewide Close-In-Place Alternative, 7 years; and for Phase 1 of the Phased Decisionmaking Alternative,[10] 8 years. For the Sitewide Removal and Phased Decisionmaking (Phase 1) Alternatives, the receptor at the nearest site boundary has the largest total dose. For the Sitewide Close-In-Place Alternative, the receptor on Cattaraugus Creek near the site has the largest dose. The dose would be highest for the Sitewide Removal Alternative: a total dose of 4.9 millirem to the MEI at the site boundary over the decommissioning time period, which would equate to an increased risk of developing a fatal cancer of 8.3×10^{-7}, or approximately 1 chance in 1.2 million. The highest dose to the MEI under the Sitewide Close-In-Place Alternative would be 0.32 millirem, with an increased fatal cancer risk of 9.3×10^{-8}, or approximately 1 chance in 11 million. The dose to the MEI for Phase 1 of the Phased Decisionmaking Alternative would be 3.8 millirem, with an increased fatal cancer risk of 5.7×10^{-7}, or approximately 1 chance in 1.8 million. There is no dose or risk for the No Action Alternative in Table 4–16 because there would be no decommissioning actions for this alternative.

Table 4–16 Total Dose and Risk to the Maximally Exposed Individual from Decommissioning Actions

	Sitewide Removal Alternative (Over 64 years)		***Sitewide Close-In-Place Alternative (Over 7 years)***		***Phased Decisionmaking Alternative – Phase 1 (Over 8 years)*** [a]		***No Action Alternative***	
Receptor	***Dose (millirem)***	***Risk (LCF)***	***Dose (millirem)***	***Risk (LCF)***	***Dose (millirem)***	***Risk (LCF)***	***Dose (millirem)***	***Risk (LCF)***
Receptor at nearest site boundary (airborne releases)	4.9	8.3×10^{-7}	0.28	7.7×10^{-8}	3.8	5.7×10^{-7}	0	0
Receptor on Cattaraugus Creek near site (liquid and airborne releases)	3.1	4.9×10^{-7}	0.32	9.3×10^{-8}	2.8	3.8×10^{-7}	0	0
Receptor on lower reaches of Cattaraugus Creek (liquid and airborne releases)	0.64	2.1×10^{-7}	0.29	1.1×10^{-7}	0.089	1.1×10^{-8}	0	0

LCF = latent cancer fatality.
[a] Phase 2 doses would be no greater than the Sitewide Removal Alternative or Sitewide Close-In-Place Alternative doses if one of these actions is selected.

Table 4–17 shows the peak annual dose to the MEI from both air and liquid releases for the alternatives. All of these radiological releases would be in compliance with 40 CFR Part 61, Subpart H. The peak annual dose to the MEI from air emissions is 0.26 millirem for the Sitewide Removal Alternative, 0.084 for the Sitewide Close-In-Place Alternative, 0.84 millirem for Phase 1 of the Phased Decisionmaking Alternative,[10] and 0.13 millirem for the No Action Alternative. This considers both releases while decommissioning actions are occurring and releases for orphan waste storage and monitoring and maintenance activities as well as releases for the No Action Alternative, which does not involve decommissioning actions.

Doses can be compared to annual background dose estimates for the same population to provide perspective. Using an average background dose rate of 360 millirem per year (NYSDOH 2005) for individuals living in Western New York, the maximum peak annual dose to the MEI (0.84 millirem for Phase 1 of the Phased Decisionmaking Alternative) from the projected releases associated with each of the decommissioning alternatives would increase the total dose to the affected individual by no more than 0.2 percent.

[10] *Depending on the decision for Phase 2 actions, (i.e., removal or in-place closure) the MEI dose and risk for the entire Phased Decisionmaking Alternative would be no greater than that presented for the Sitewide Removal or Sitewide Close-In-Place Alternatives.*

Table 4–17 Peak Annual Dose and Risk to Potential Maximally Exposed Individual

Receptor	*Sitewide Removal Alternative*		*Sitewide Close-In-Place Alternative*		*Phased Decisionmaking Alternative – Phase 1* [a]		*No Action Alternative*	
	Dose (millirem)	*Risk (LCF)*	*Dose (millirem)*	*Risk (LCF)*	*Dose (millirem)*	*Risk (LCF)*	*Dose (millirem)*	*Risk (LCF)*
Receptor at nearest site boundary [b]	0.26	8.4×10^{-8}	0.084	2.1×10^{-8}	0.84	1.1×10^{-7}	0.13	4.0×10^{-9}
Receptor on Cattaraugus Creek near site [c]	0.15	4.1×10^{-8}	0.14	4.1×10^{-8}	0.65	8.9×10^{-8}	0.23	5.9×10^{-8}
Receptor on lower reaches of Cattaraugus Creek [c]	0.017	5.6×10^{-9}	0.11	3.8×10^{-8}	0.02	2.7×10^{-9}	0.61	2.1×10^{-7}

LCF = latent cancer fatality.
[a] Phase 2 doses would be no greater than the Sitewide Removal Alternative or Sitewide Close-In-Place Alternative doses if one of these actions is selected.
[b] Impacts due to airborne releases.
[c] Impacts due to air- and waterborne releases.

Worker

This section presents estimates of the dose to the workers on the WNYNSC Site during decommissioning actions and during the period following completion of decommissioning actions. The occupational doses were estimated as part of the preliminary engineering work for each alternative. The method for estimating occupational exposure is presented in the methodology technical report (WSMS 2008e), and the specific estimates are presented in the technical reports for the various alternatives (WSMS 2008a, 2008b, 2008c, 2008d).

The first row in **Table 4–18** shows the total dose to the worker population from the decommissioning actions, while the second row shows the average annual individual worker dose from decommissioning actions. The third row on the table presents the annual worker population dose for activities following completion of the decommissioning actions as well as those from storage of waste, monitoring, maintenance, and as needed replacement of the SDA geomembrane, North Plateau Groundwater Plume permeable reactive barrier, and permeable treatment wall. The values in the third row are based on the assumption that no orphan waste remains on site. The fourth row presents the annual worker population dose for all the post-decommissioning actions in the third row, plus the dose from monitoring any orphan waste generated from decommissioning actions.

The Sitewide Removal Alternative has no long-term activities other than storage of potential orphan waste. The Sitewide Close-In-Place Alternative would have significant monitoring and maintenance activities, and the incremental exposure from the storage of orphan waste would be very small. The annual worker population monitoring and maintenance dose following completion of the Phase 1 removal actions is greater than that for the maintenance requirements for the Sitewide Close-In-Place Alternative because the facilities are in a condition similar to the No Action condition and have not been placed in a low-maintenance configuration.

The range of annual doses to the post-decommissioning monitoring and maintenance worker can be estimated based on a review of historical data for site workers. Site workers performing work similar to the type envisioned for post-decommissioning monitoring and maintenance, plus some higher exposure work, receive annual doses from 10 millirem per year to as high as 60 millirem per year. When allowances are made for the fact that higher-exposure work would not be included in post-decommissioning monitoring and maintenance, it is estimated that the annual dose to post-decommissioning monitoring and maintenance workers will generally be in the range of 10 to 20 millirem per year.

Table 4–18 Projected Worker Dose and Risk During and After Decommissioning

	Sitewide Removal Alternative		*Sitewide Close-In-Place Alternative*		*Phased Decisionmaking Alternative – Phase 1* [d]		*No Action Alternative* [b]	
	Dose	*Risk (LCF)*	*Dose*	*Risk (LCF)*	*Dose*	*Risk (LCF)*	*Dose*	*Risk (LCF)*
Total worker population dose from decommissioning actions (person-rem) [a]	1,090	0.7	133	0.08	135	0.08	0	0
Average individual worker dose from decommissioning actions [a] (millirem per year)	66	0.00004	44	0.00003	58	0.00003	0	0
Total annual worker population dose for actions following decommissioning actions – no generated orphan waste monitoring and maintenance (person-rem per year)	0.0	0.0	0.2	0.0001	2.0	0.001	2.6	0.002
Total annual worker population dose for actions following decommissioning actions – with generated orphan waste monitoring and maintenance (person-rem per year)	0.15	0.00008	0.2 [c]	0.0001	2.0 [c]	0.001	2.6	0.002

LCF = latent cancer fatality.
[a] Based on a total workforce of 258, 301, and 232 persons for the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives, respectively.
[b] The No Action Alternative has no decommissioning actions.
[c] The contribution to this dose from orphan waste is small relative to that from the other wastes.
[d] Depending on the decision for Phase 2 actions, (i.e., removal or close-in-place) the Phase 2 projected worker dose and risk would be no greater than that projected for the Sitewide Removal or Sitewide Close-In-Place Alternatives. If Sitewide Removal is chosen for Phase 2, the total worker population dose for this phase is estimated to be about 914 person-rem. If Sitewide Close-In-Place is chosen for Phase 2, the total worker population dose for this phase would be 95.5 person-rem.
Sources: WSMS 2008a, 2008b, 2008c, 2008d, 2008e.

As shown in Table 4–18, total worker dose for the decommissioning alternatives range from 133 person-rem for the Sitewide Close-In-Place Alternative to 1,090 person-rem for the Sitewide Removal Alternative. These doses would be expected to result in less than 1 (0.08 to 0.7) additional fatal cancers among the involved worker population. The average annual worker dose would range from 44 millirem for the Sitewide Close-In-Place Alternative to 66 millirem for the Sitewide Removal Alternative. Note that DOE limits dose to a worker to 5 rem per year, but an administrative control limit of 500 millirem per year has been established for WVDP activities (10 CFR 835.202, WVNSCO 2006). All workers working in radiation areas would be monitored to ensure they stayed within annual limits.

Table 4–19 presents the estimated worker nonradiological accidents and fatalities that could occur from actions planned for each of the proposed alternatives. These estimates were projected using DOE's historical database for worker injuries and fatalities at its facilities as discussed in Chapter 3, Section 3.11.4, of this EIS. Using the projected number of hours involved in implementing the alternatives and the historical accident rates, it is estimated that the number of reportable cases would be 685 for the Sitewide Removal Alternative with 340 lost workdays; for the Sitewide Close-In-Place Alternative, there would be 189 reportable cases and 91 lost workdays. Phase 1 of the Phased Decisionmaking Alternative would result in 123 reportable cases; if removal were selected for Phase 2, the number for both phases could be as many as that for the Sitewide Removal Alternative, while if close-in-place was selected, the number for both phases could be as many as the Sitewide Close-In-Place Alternative. No fatalities from worker accidents are expected under the proposed alternatives. These estimates are for work accomplished on site and do not include transportation of the materials off site. Transportation accidents are addressed in Section 4.1.12, Transportation, of this EIS.

Table 4–19 Conventional Worker Injuries and Fatalities for Implementing Each Alternative

	Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative – Phase 1*	*No Action Alternative (per 100 years)*
Total Reportable Cases	685	189	123	245
Lost Workday Cases	340	91	68	115
Estimated Fatalities	0.50	0.086	.063	0.043

4.1.9.2 Accident Impacts

Radiological Accident Impacts

This section estimates the consequences of significant radiological accidents and radiological accident risk during decommissioning activities for the decommissioning alternatives. The consequences of short-term significant radiological accidents that could occur over minutes to days are presented both in terms of radiation dose and LCFs. LCFs from radiation doses are based on a 50-year latent time period after exposure to a radiation dose. The latent cancer risks are based on accident-specific probability estimates.

For each alternative, a range of postulated accidents that encompasses a range of annual frequencies and radiological consequences was examined to provide a basis for estimating risk and for understanding the differences in accident risk for the various alternatives.

Radiological accidents were identified by reviewing the description of facilities and operations presented in the engineering reports for each of the alternatives (WSMS 2008a, 2008b, 2008c, 2008d, 2008e), the West Valley Safety Analysis Report (WVNS 2004a), and relevant EISs including the *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* (DOE/EIS-0337F) (DOE 2003e) and the *Final Environmental Impact Statement on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Center (Plutonium Residues EIS)* (DOE/EIS-0277F) (DOE 1998). The *Plutonium Residues EIS* is relevant to this analysis because it analyzes a number of accidents involving buildings or structures with similar contamination and seismic collapse scenarios as the Main Plant Process Building accident scenario analyzed in this EIS.

Accident scenario identification focuses on accidents that would have greater consequences or higher frequencies (i.e., greater than 10^{-6} per year); therefore, attention was focused on buildings or structures that have high radionuclide inventories (the Main Plant Process Building and the Waste Tank Farm), as well as operations that are conducted multiple times (the filling and handling of waste packages) or that would have limited or no features that would mitigate the effects of an accident (outdoor waste package handling operations). Radionuclide inventories in other facilities and in soil being removed are at a much lower concentration or activity level, and accidents involving them would be bounded by potential accidents involving the aforementioned structures and components.

After the spectrum of accidents was identified, release fractions and accident frequency were estimated. The previously noted Safety Analysis Reports and EISs provided a basis for estimating accident frequency. The radiological impacts from accident releases were calculated using the MACCS2 computer code (Sandia 1997), which estimates radiological doses and health effects from accidental releases to the atmosphere. A further description of the accident identification and analysis methodology is presented in Appendix I, Section I.5, of this EIS.

A total of 15 individual accident scenarios were analyzed, including a scenario involving the Main Plant Process Building, a scenario involving the Waste Tank Farm, 11 scenarios involving radioactive waste packages, a scenario involving the NDA, and a scenario involving the SDA. The accident scenarios for the Main Plant Process Building and the Waste Tank Farm are assumed to be initiated by a seismically-induced structural failure. The radioactive waste package accident scenarios encompassed all the different types of waste packages and initiators such as a drop, puncture, or fire. The NDA and SDA accident scenarios involve exhumation and plume release initiated by a fire. A detailed discussion of the different accident scenarios is presented in Appendix I, Section I.5, of this EIS.

This EIS does not present a quantitative analysis of accident consequences and risks to workers because there is no adequate method for calculating meaningful consequences at or near the location where the accident occurs. The results are dependent on details of worker location and actions immediately following the accident and parameters that have a very large uncertainty and vary significantly over time. The risk to these workers would be due to both radiological and nonradiological effects. For example, in a fire, the involved workers could be exposed to both airborne radioactive material and the smoke and heat of the fire. Similarly, in an earthquake, involved workers could be exposed to both airborne radioactive material and could be injured or killed by the collapse of a structure before they could be evacuated.

The consequences and annual risks for the dominant accident scenarios associated with each alternative are presented in **Table 4–20**. For each alternative, the largest consequence estimate to the general population and the MEI, as well as the dominant annual risk contributor, are **bold**. It should be noted that for the Phased Decisionmaking Alternative, only Phase 1 accident consequences and risks have been analyzed. Accident consequences and risks for Phase 2 of this alternative could be larger, depending on the decision about further actions, but they would be no greater than those for the Sitewide Removal Alternative.

To put the doses from these accidents in perspective, the largest dose to the MEI of 0.68 rem from the Greater-Than-Class C drum puncture scenario is below any dose for which any health effects could occur in an individual, and much lower than the allowable annual worker dose. The maximum MEI latent cancer risk of 0.000033 from the Greater-Than-Class C drum puncture accident scenario means there is about 1 chance in 30,000 of an LCF to the MEI for the most severe accident. For comparison and assuming one such accident over the lifetime of a worker, the latest National Cancer Institute statistics (NCI 2008) indicate that the chance of a fatal latent cancer in all Americans over their lifetime is about 0.22, or about slightly greater than one chance in five.

The maximum accident population dose of 3.4 person-rem is a small percentage (less than 0.001 percent) of the annual background population dose of 612,000 person-rem that would be received by the 1.7 million residents within an 80-kilometer (50-mile) radius of WNYNSC. Another perspective on the population dose from this postulated bounding accident is that the risk to the average individual in the general population in terms of developing an LCF from this dose is 1.3×10^{-9}, or 1 chance in 770 million.

In considering the overall risk from accidents for an alternative, it is necessary to consider the duration of the various operations in the decommissioning process. In addition, in the case of radioactive waste package handling accidents, the total number of packages and annual handling rate must be considered. **Table 4–21** is a summary of the estimated number of years that each type of operation would occur for each alternative and the respective number of radioactive waste packages handled. This table only presents values for Phase 1 of the Phased Decisionmaking Alternative. Phase 2 could result in additional radioactive waste package handling up to that analyzed for the Sitewide Removal Alternative, depending on the decisions on Phase 2 actions.

Table 4–20 Dominant (Bounding) Accident Annual Risk and Consequences During Decommissioning

Bounding Accident	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative – Phase 1* [e]	*No Action Alternative*
Main Plant Process Building Collapse (frequency = 0.0001 per year)				
Population dose MEI dose [a] Population annual risk MEI annual risk [a]	0.68 person-rem 0.046 rem 4.1×10^{-8} 2.7×10^{-9}	**0.68 person-rem** **0.046 rem** 4.1×10^{-8} 2.7×10^{-9}	**0.68 person-rem** **0.046 rem** 4.1×10^{-8} 2.7×10^{-9}	**0.68 person-rem** **0.046 rem** **4.1×10^{-8}** **2.7×10^{-9}**
Radioactive Waste Package Handling Accidents				
Greater-Than-Class C Drum Puncture [d] *(frequency = 0.08 per year)*				
Population dose MEI dose [b] Population annual risk MEI annual risk [b]	1.9 person-rem **0.68 rem** **0.000091** **0.000033**	Not applicable	Not applicable	Not applicable
High-Integrity Container Class B/C Fire (frequency = 0.0001 per year)				
Population dose MEI dose [b] Population annual risk MEI annual risk [b]	**3.4 person-rem** 0.053 rem 2.0×10^{-7} 3.2×10^{-9}	**3.4 person-rem** 0.053 rem 2.0×10^{-7} 3.2×10^{-9}	**3.4 person-rem** 0.053 rem 2.0×10^{-7} 3.2×10^{-9}	Not applicable
High-Integrity Container Class B/C Puncture [d] *(frequency = 0.08 per year; 0.008 per year; 0.1 per year)* [f]				
Population dose MEI dose [b] Population annual risk MEI annual risk [b]	0.12 person-rem 0.033 rem 5.8×10^{-6} 1.6×10^{-6}	0.12 person-rem 0.033 rem 5.8×10^{-7} 1.6×10^{-7}	0.12 person-rem 0.033 rem 7.2×10^{-6} 2.0×10^{-6}	Not applicable
Class B/C Box Puncture [d] *(frequency = 0.08 per year; 0.008 per year; 0.1 per year)* [f]				
Population dose MEI dose [b] Population annual risk MEI annual risk [b]	0.12 person-rem 0.028 rem 5.8×10^{-6} 1.3×10^{-6}	0.12 person-rem 0.028 rem **5.8×10^{-7}** **1.3×10^{-7}**	0.12 person-rem 0.028 rem **7.2×10^{-6}** **1.7×10^{-6}**	Not applicable
Class A Box Puncture [d] *(frequency = 0.08 per year; 0.008 per year; 0.1 per year; 0.003 per year)* [f]				
Population dose MEI dose [b] Population annual risk MEI annual risk [b]	0.00038 person-rem 0.000091 rem 1.8×10^{-8} 4.4×10^{-9}	0.00038 person-rem 0.000091 rem 1.8×10^{-9} 4.4×10^{-10}	0.00038 person-rem 0.000091 rem 2.3×10^{-8} 5.5×10^{-9}	0.00038 person-rem 0.000091 rem 6.8×10^{-10} 1.6×10^{-10}
Radioactive Waste Exhumation Accident				
SDA Exhumation Fire (frequency = 0.0001 per year)				
Population dose MEI dose [c] Population annual risk MEI annual risk [c]	0.041 person-rem 0.0018 rem 2.5×10^{-9} 1.1×10^{-10}	Not applicable	Not applicable	Not applicable

MEI = maximally exposed individual.

[a] Located 244 meters (800 feet) from the accident.

[b] Located 183 meters (600 feet) from the accident.

[c] Located 2,500 meters (8,200 feet) from the accident.

[d] This accident scenario involves human error while handling the package, which results in an object penetrating the confinement wall of the package and a release of radioisotopes to the environment.

[e] Phase 2 doses would be no greater than the Sitewide Removal Alternative or Sitewide Close-In-Place Alternative doses if one of these actions is selected.

[f] The listed three frequencies are for accidents associated with the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives, respectively.

Note: Not applicable indicates that the specific type of radioactive waste package is not used for the alternative.

Table 4–21 Risk Duration for Major Accident Scenarios

	Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Years before initiating Main Plant Process Building removal or stabilization	7	1	1	No removal or stabilization
Years before Waste Tank Farm removal or stabilization	24	2	No removal or [b] stabilization	No removal or stabilization
Years of radioactive waste package handling during decommissioning actions	64	7	8	0 [a]
Number of radioactive waste packages handled	234,282	2,630	38,166 [b]	3,561 every 25 years [a]
Annual radioactive waste package handling rate	3,661	376	4,771 [b]	143 [a]

[a] Average over 25-year time intervals to account for periodic waste disposal, along with annual expected waste disposal volumes, and assumes drums for Class A waste and the low specific activity container for low specific activity waste. This alternative does not involve preparation for decommissioning.
[b] The status of the Waste Tank Farm and numbers/ratio of radioactive waste packages may change for Phase 2, depending on the decision on actions for this phase.
Sources: WSMS 2008a, 2008b, 2008c, 2008d.

The combination of the annual risk estimate for various accident types and the activity duration estimates supports the development of an overall relative risk estimate for the EIS alternatives for accidents that would involve short-term releases of radionuclides to the atmosphere. This overall relative risk is presented in **Table 4–22**. The terms used in this table (highest, medium, and lowest) are intended to convey a relative qualitative assessment of the accident risk among the alternatives. The absolute magnitude of accident consequences and risks for all alternatives is estimated to be very small and is not expected to present a significant health risk to the general population.

Table 4–22 Relative Accident Population and Maximally Exposed Individual Annual Risk Comparison Rating Between Alternatives

Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Highest [a]	Low [a]	Low [a, b]	Lowest [a]

[a] These terms are meant to show a relative comparison between alternatives of the very small radiological consequences and risks for all short-term accident scenarios for all alternatives.
[b] Depending on the decision for Phase 2 actions, the relative risk could remain low or be as high as for the Sitewide Removal Alternative.

The Sitewide Removal Alternative has the greatest potential for a short-term accident with the highest consequences and is expected to have the highest overall short-term accident risk because it has the greatest number and duration of higher radioactivity content waste removal, packaging, and handling operations, and because the actions would take place over a longer period of time.[11]

The most significant short-term accidents for the Sitewide Close-In-Place, Phased Decisionmaking (Phase 1)[11], and No Action Alternatives have lower projected consequences than the Sitewide Removal Alternative accident scenarios. The overall accident risk for these alternatives is estimated to be less than the overall accident risk for the Sitewide Removal Alternative. The overall accident risk for Phase 1 of the Phased

[11] *Decisions on Phase 2 actions for the Phased Decisionmaking Alternative may change the relative risk of this alternative.*

Decisionmaking Alternative is slightly higher than the risk for the Sitewide Close-In-Place and No Action Alternatives as a result of the additional activity related to the Main Plant Process Building removal and the greater number of annual radioactive waste handling operations.

The most serious accident for the No Action Alternative, in terms of population dose, is the same as that for the Sitewide Close-In-Place and Phased Decisionmaking (Phase 1) Alternatives,[11] but the overall risk from accidents involving short-term releases to the atmosphere for this alternative is estimated to be lower than the risk for the other two alternatives. The No Action Alternative does, however, have a higher risk of groundwater contamination over the long term as a result of degradation of the Main Plant Process Building and Waste Tank Farm because these facilities are not remediated under this alternative. It should also be noted that there are no plans for removal of the high-level radioactive waste tanks in Phase 1 of the Phased Decisionmaking Alternative.

Toxic Chemical Accident Impacts

The basic method for toxic chemical accident analysis is comparable to that used for radioactive material accident analysis. The methodology and more detailed results are presented in Appendix I, Section I.5.8, of this EIS.

The operations that would be conducted under the various alternatives do not involve the use of toxic chemicals as process chemicals, therefore, no processing accidents involving hazardous chemicals were analyzed.

Resource Conservation and Recovery Act (RCRA) hazardous materials exist in the high-level radioactive Waste Tank Farm, the Main Plant Process Building, the NDA, and the SDA (WSMS 2005a, 2005b, 2005c; SAIC 2005a, 2005b). These inventories exist within equipment and individual components such as switches, lamps, and shielded windows, and are not concentrated in one tank or physical location. Their physical and chemical forms are not consistent with serious accident consequences because the inventory is limited, generally solid, and dispersed. In the event of an accident involving a high-level radioactive waste tank, Main Plant Process Building, or the NDA or SDA, the largest risks would be associated with the radioactive materials, as discussed earlier in this section. Any risk from toxic chemicals present in these areas would be a fraction of the radiological risk. Based on the type, form, and distribution of toxic chemicals at WNYNSC, no credible toxic chemical accidents affecting worker or public health would be expected to occur.

4.1.10 Long-term Human Health

This section summarizes quantitative estimates of long-term health impacts of the Sitewide Close-In-Place and No Action Alternatives, and provides a qualitative discussion of impacts for the Phased Decisionmaking Alternative. Long-term impacts occur for these alternatives because radioactive materials would be left on site. For the purposes of this analysis, long-term is considered to be at least 10,000 years, and may be up to 100,000 years if the predicted peak annual dose occurs later. Consistent with the screening analysis presented in Appendix D of this EIS, this section on long-term impacts considers groundwater and erosion releases.

The long-term performance assessment contains many modeling details and assumptions that cannot be repeated in full here.

- For a more detailed presentation of the contents of Section 4.1.10, see Appendix H of this EIS.
- For a description of the groundwater models (3-D and 1-D) used in the Long-term Performance Assessment, see Appendix E of this EIS.

- For a description of the erosion models used in the Long-term Performance Assessment, see Appendices F and G of this EIS.
- For a description of how the various onsite and offsite scenarios were modeled, and specifically how human health impacts were calculated, see Appendix G of this EIS.
- For more detailed identification of the receptors, see Appendix H of this EIS.
  - Figure H–2 shows the location of the offsite receptors.
  - Figure H–3 shows the location of the receptors chosen for erosion modeling of the Low-Level Waste Treatment Facility, NDA, and SDA, and of the wells used in contaminated groundwater scenarios.
- For a discussion of assumptions made about the performance of engineered barriers in the cases of indefinite continuation of institutional controls and loss of institutional controls after 100 years, see Appendix H, Section 2.2.1, of this EIS.
- For sensitivity studies, see Appendix H, Section H.3, of this EIS.

Estimates of health impacts are presented for both radiological and chemical constituents. For radionuclides, health impacts are estimated as dose and lifetime risk of incidence of cancer (morbidity). Cumulative impacts of a mixture of radionuclides are estimated as the sum of dose or risk of the individual radionuclides. For chemicals, health impacts are estimated as hazard quotients for non-carcinogens and as lifetime risks of incidence of cancer for carcinogens. Cumulative impacts of a mixture of chemicals are estimated as the sum of hazard quotients, termed "hazard index," or as the sum of the risks for the individual chemicals. For the assessment of impacts of normal operations and accidents (including those from transportation) during the near-term period, estimates of health impacts were presented as excess fatal cancers (latent cancer fatalities), consistent with DOE guidance (DOE 2004d) for NEPA analysis. However, for the long-term performance assessment, comparison with the CERCLA risk range is desired and the appropriate measure of impact for this comparison is incidence of cancer (EPA 1989).

Also note that NYSERDA's preferred alternative for the SDA is to manage the facility in place for up to 30 more years. Appendix P describes the analyses and conclusions of a quantitative risk assessment for the SDA which evaluates the risk to the public from continued operation of the SDA for the next 30 years with its current physical and administrative controls.

4.1.10.1 Summary of Long-term Performance Analysis

The natural processes that would move any WNYNSC contamination from the site to surface waters and then to downgradient water users would result in long-term impacts. The downstream concentrations would vary with time because different contaminants would be released from the WMAs at different rates.

The reasonably foreseeable population and individuals that would be impacted by releases from WNYNSC would be downgradient water users who use water taken from eastern Lake Erie or the eastern branch of the Niagara River. The reasonably foreseeable time-integrated dose received by a population the size of that currently downstream of the site depends on the actions taken to manage the waste at WNYNSC. Under the No Action Alternative, and assuming indefinite continuation of institutional controls the estimated additional dose to the downstream population integrated over 1,000 years would be about 2,000 person-rem. This estimated population dose would be about 2,100 person-rem for the Sitewide Close-In-Place Alternative, and effectively reduced to zero for the Sitewide Removal Alternative.

A Difference of Opinion about the Analysis of Long-term Impacts

NYSERDA and DOE support the Phased Decommissioning Alternative. The agencies agree that under the first phase of this alternative, important work would be conducted that the agencies believe is critical to keep the project moving toward completion. There is disagreement, however, regarding the level of additional analysis related to long-term performance assessment required to support the Phase 2 decisions.

DOEs View. DOE acknowledges the uncertainty inherent in long-term (i.e., 10,000 to 100,000 years) performance assessment modeling. Section 4.3.5 of this chapter contains a comprehensive list of uncertainties that affect the results of the long-term performance assessment of the site. DOE's analyses account for these uncertainties using state-of-the-art models, generally accepted technical approaches, existing credible scientific methodology, and the best available data in such a way that the predictions of peak radiological and hazardous chemical risks are expected to be conservative (i.e., the results are more likely to overstate rather than understate the actual future consequences). Furthermore, DOE believes the analyses and disclosure of uncertainties in this Draft EIS provide a sufficient quality of information to adequately support agency decisionmaking for all of the reasonable alternatives.

NYSERDAs View. As explained in the Foreword to this Draft EIS, NYSERDA believes that the Draft EIS technical analyses of soil erosion, groundwater flow, and contaminant transport, engineered barriers, and uncertainty are not technically defensible for use in long-term decisions regarding West Valley cleanup. NYSERDA does not agree that the analyses are adequate to demonstrate that the predictions of peak radiological and chemical risk are conservative, and NYSERDA believes that a comprehensive analysis of uncertainty is needed.

Assuming indefinite continuous institutional controls, the peak annual dose to reasonably foreseeable offsite individuals who are postulated to use the contaminated water of Cattaraugus Creek just outside the site boundary for drinking, irrigation, and a source of contaminated fish would be about 0.22 millirem for both the No Action and Sitewide Close-In-Place Alternatives. The peak annual dose for the Sitewide Removal Alternative would be negligible.[12]

The dose to individuals who could inadvertently intrude onto the site following an assumed loss of institutional controls would be very dependent on the actions of the intruders and where these actions occur. A spectrum of possible intruders was postulated and analyzed, ranging from those who repeatedly hike around the site to those who establish a home, a local water well, and a garden. For the No Action Alternative, the doses for the resident farmer who intrudes directly into the waste or drills a well immediately downgradient of the waste would be substantial, even fatal. The doses to these same intruders would be substantially reduced for the Sitewide Close-In-Place Alternative because barriers would be used that are presumed to prevent near-term intrusion. Hydrologic barriers would also be used to retard downgradient migration of radionuclides.

The long-term performance assessment also included an analysis of the impacts from unmitigated erosion for the Sitewide Close-In-Place and No Action Alternatives. The erosion model predicts that serious erosion is only plausible for the Low-Level Waste Treatment Facility and the NDA and SDA. The estimated erosion-caused population dose to the downstream population (Lake Erie water use) when integrated over 1,000 years would be about 2,200,000 person-rem for the Sitewide Close-In-Place Alternative and 2,300,000 person-rem

[12] *The dose to an individual coming in direct contact with the residual contamination would be less than 25 millirem per year. Any receptor coming into contact with residual contamination that has migrated from its original location (the more likely scenario) would receive a much lower dose.*

for the No Action Alternative. The peak annual dose to reasonably foreseeable offsite individuals due to unmitigated erosion would be in the range of about 60 to 130 millirem for both alternatives.

Note that the analytical results presented here are from deterministic runs that are considered to be generally conservative;[13] the deterministic and sensitivity/uncertainty analyses are presented in Appendix H, Section H.3, of this EIS.

4.1.10.2 Sitewide Removal Alternative

The Sitewide Removal Alternative is addressed separately because it would entail decontamination of the entire site, so it is available for unrestricted use. This means that the radiation dose to any reasonably foreseeable onsite receptor would be less than 25 millirem per year. The residual contamination is not known with enough precision to warrant an offsite dose analysis, but it is recognized that offsite dose consequences would be substantially below those for the Sitewide Close-In-Place Alternative or the No Action Alternative.

Radioactive Contamination

Under this alternative, any remaining residual radiological contamination would be below the unrestricted use dose criteria of 10 CFR 20.1402. To demonstrate that decommissioning is adequate would require analysis of a number of representative, reasonably conservative scenarios to ensure that none of the range of potential human activities on the site would lead to the accumulation of individual radiation doses exceeding the unrestricted use dose criteria. One possible way of achieving this would be to use the analysis of the scenarios to estimate derived concentration guideline limits (DCGLs) that could be used as decommissioning targets in various parts of the site. Examples of how this could be done are provided for a residential farmer scenario and a recreational hiker scenario in Appendix H of this EIS. In practice, official DCGLs would be developed through the Decommissioning Plan process.

Hazardous Chemical Contamination

Under this alternative, facilities and areas with hazardous chemical contamination would be removed in compliance with the criteria for clean closure. The criteria could include New York State Department of Environmental Conservation (NYSDEC) TAGM-4046, *Determination of Soil Cleanup Objectives and Cleanup Levels* (NYSDEC 1994), and NYSDEC Division of Water, Technical and Operational Guidance Series 1.1.1, *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent, Limitations* (NYSDEC 1998b), or other agency-approved cleanup objectives that are protective of human health and the environment (e.g., risk-based action levels).

4.1.10.3 Alternatives with Waste On Site

The remainder of this analysis addresses the impacts that would be expected to result from implementing the Sitewide Close-In-Place Alternative and the No Action Alternative, respectively[14]. These two alternatives would leave some amount of hazardous and radioactive material on site. The analysis addresses the impacts caused by releases to the local groundwater that then discharges to onsite streams (Franks Creek and Buttermilk Creek) to a spectrum of individual and population receptors located outside the current WNYNSC boundary. It also addresses the effects of radionuclide releases on individual receptors and the local

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[13] *The major assumptions that contribute to the assessment that the estimates of dose are conservative are listed in Section 4.3.5 of this chapter. Appendix H, Section H.3, of this EIS contains a sensitivity analysis that reinforces the conclusion that the results are generally conservative.*

[14] *There is no long-term performance assessment for the Phased Decisionmaking Alternative, because the long-term impact depends on the final condition, which is yet to be defined. There is a qualitative discussion of the impacts of the Phased Decisionmaking Alternative in Appendix H, Section H.2.3, of this EIS, and in Section 4.1.10.4 of this chapter.*

population, and the effect of both radionuclide and hazardous chemical releases on the two closest individual receptors.

The information is presented in two sections. The first section (Section 4.1.10.3.1) addresses impacts given continuation of institutional controls. These impacts take credit for institutional controls that prevent access to the WMAs and maintain engineered features such as erosion control structures and engineered caps. The information is also used to estimate total risk to offsite receptors from both radionuclides and hazardous chemicals; in the latter case, for comparison to Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) risk criteria.

The second section (Section 4.1.10.3.2) addresses impacts assuming loss of institutional controls.[15] This section analyzes potential impacts for two general situations. The first is loss of institutional controls after 100 years so that intruders are allowed to enter WNYNSC and various WMAs. Doses and risks are assessed for intruders assumed to occupy the Buttermilk Creek Area (Section 4.1.10.3.2.1) or the North and South Plateaus (Section 4.1.10.3.2.2). The second is an assumed loss of institutional controls (no monitoring and maintenance) after 100 years. Under this assumption, Section 4.1.10.3.2.3 addresses impacts to offsite receptors, while Section 4.1.10.3.3 addresses impacts to offsite receptors assuming unmitigated erosion occurs. The analytical results presented here are from deterministic runs that are considered to be generally conservative.[16] More details on both the deterministic and sensitivity/uncertainty analyses are presented in Appendix H of this EIS.

4.1.10.3.1 Indefinite Continuation of Institutional Controls

This section presents long-term radiological dose and radiological and hazardous chemical risks to offsite receptors and populations for the Sitewide Close-In-Place and No Action Alternatives. All of the impacts discussed in this section are the result of groundwater flow through WMAs and the discharge of contaminated groundwater to either Franks Creek or Buttermilk Creek. The section is organized by receptor, beginning with the nearest offsite receptor and progressing to the farthest.[17] The receptors are:

- Cattaraugus Creek downstream of the confluence with Franks Creek;
- Cattaraugus Creek – Seneca Nation of Indians, Cattaraugus Reservation; and
- Lake Erie water users, including water intake systems at Sturgeon Point and in the Niagara River downstream of Cattaraugus Creek.

Cattaraugus Creek Receptor

The Cattaraugus Creek receptor is a postulated offsite receptor who is close to the site boundary and experiences the impact of liquid release from all portions of the site. This receptor is conservatively assumed to drink water from Cattaraugus Creek, eat local fish and deer, and irrigate his garden with water from Cattaraugus Creek.

A residential farmer is an example of a Cattaraugus Creek receptor. There are several such receptors in this analysis. In general, the residential farmer scenario is based on contact with contamination in surface soil and involves a set of activities including living in a home, maintaining a garden, and harvesting fish. The scenario may be initiated by irrigation with contaminated surface water. For both radionuclides and hazardous

[15] In the long-term performance analysis, the institutional controls are assumed to be lost after 100 years.
[16] The major reasons that contribute to the assessment that estimates of dose are conservative are listed in Section 4.3.5 of this chapter. Sensitivity analyses presented in Appendix H, Section H.3, of this EIS, reinforce the expectation that the results of the analysis are conservative.
[17] Receptors are described in detail in Appendix D, Section D.3.1.3, of this EIS.

chemicals, maintenance of a home and garden involves inadvertent ingestion of soil, inhalation of fugitive dust, and consumption of crops and animal products. For radionuclides, an additional pathway, exposure to external radiation, is also evaluated.

Radiological Risk

Table 4–23 presents the peak annual total effective dose equivalent (TEDE) from each of the major WMAs within WNYNSC, and the timing of that peak. The years to peak exposure were measured from a starting date of 2020.[18]

The results presented in Table 4–23 show that the total peak annual dose to the Cattaraugus Creek receptor due to groundwater releases would be below 25 millirem per year in the case of indefinite continuation of institutional controls. For both the No Action Alternative and the Sitewide Close-In-Place Alternative, the SDA would be the largest contributor to the peak annual dose, with the peak occurring around 33,800 years in the future. Detailed analysis shows that the dominant radionuclides in the SDA groundwater release pathway would be uranium isotopes, and the major pathway would be fish consumption.

The last row of Table 4–23 shows the magnitude and timing of the peak dose when release for all facilities are considered. This was developed from an analysis of the dose to the Cattaraugus Creek receptor for each year following completion of decommissioning actions. **Figure 4–3** presents this annual dose as a function of time to a Cattaraugus Creek receptor for the Sitewide Close-In-Place Alternative. This figure shows the dominant role of the SDA. **Figure 4–4** provides a similar plot for the No Action Alternative.

Table 4–23 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Cattaraugus Creek Receptor (year of peak exposure in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	0.019 (200)	0 [b]
Vitrification Facility – WMA 1	0.000082 (500)	0 [b]
Low-Level Waste Treatment Facility – WMA 2	0.00015 (100)	0.0092(100)
Waste Tank Farm – WMA 3	0.0029 (200)	0 [b]
NDA – WMA 7	0.018 (6,800) [c]	0.018 (6,800) [c]
SDA – WMA 8	0.21 (33,800) [c]	0.21 (33,800) [c]
North Plateau Groundwater Plume	0.072 (79)	0.11 (68)
Total	0.22 (33,700)	0.22 (33,400)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.
[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.
[b] It is assumed that proactive maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational indefinitely. The doses from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.
[c] The predicted TEDEs and years until peak exposure are the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

[18] *In Table 4-23 and other tables and figures, the years until total peak dose or risk do not coincide with the years until peak individual WMA doses because the total peak is not a simple sum of individual peaks.*

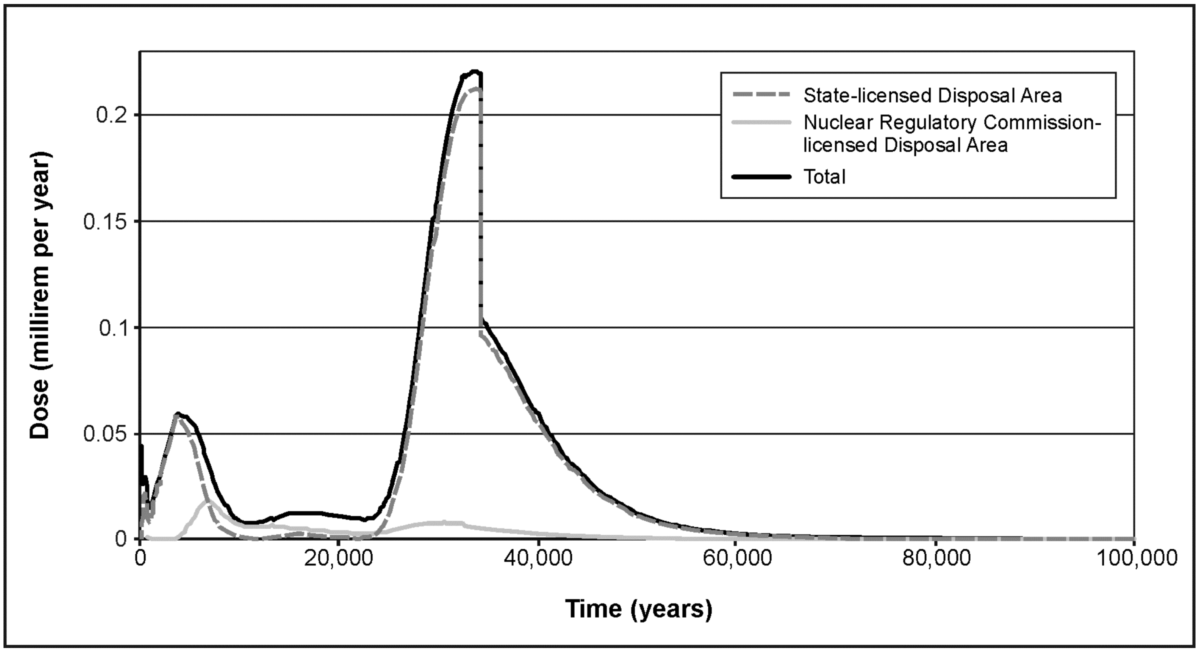

Figure 4–3 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor with the Sitewide Close-In-Place Alternative and Indefinite Continuation of Institutional Controls

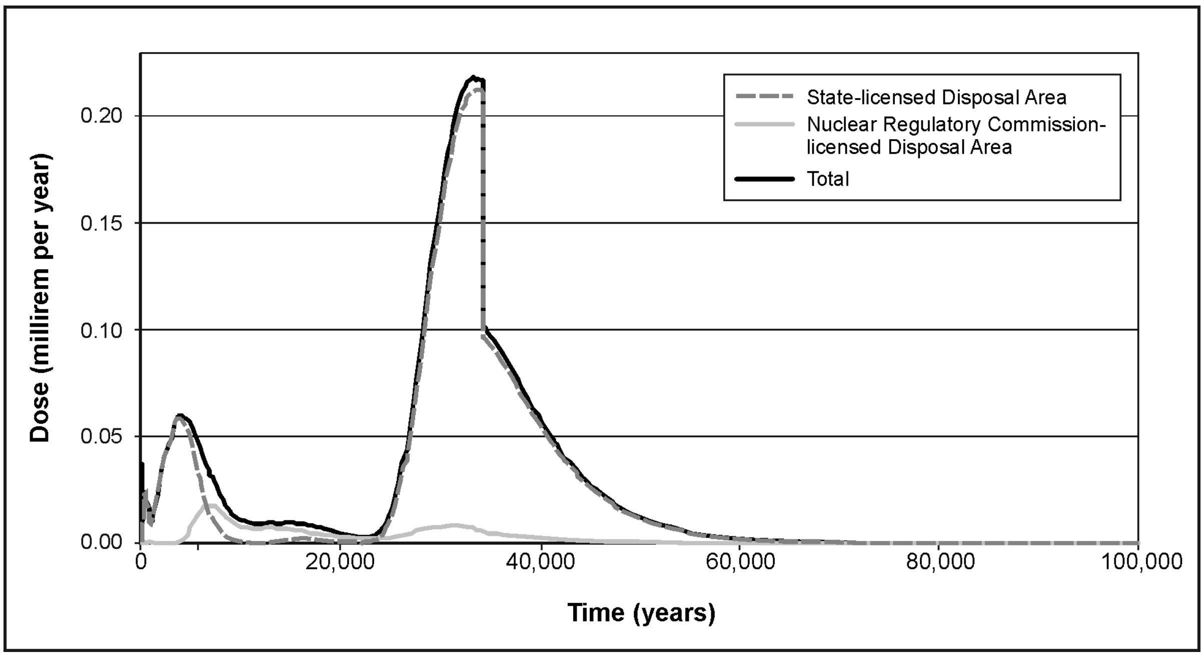

Figure 4–4 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor with the No Action Alternative and Indefinite Continuation of Institutional Controls

All of the individual doses reported in Table 4–23 are far below the dose that would be received from background radiation. For example, the average individual background dose in the United States is 360 millirem per year, of which about 200 millirem is due to radon (DOE 2000b). Another useful data point for comparison is that an individual making a roundtrip from New York to Los Angeles by jet plane would accumulate about 2.5 millirem. The peak annual dose for both the No Action Alternative and the Sitewide Close-In-Place Alternative is 0.22 millirem, or about 0.061 percent of the average background dose from natural and manmade sources.

A complimentary measure is the peak lifetime risk (excess risk of morbidity, or risk of contracting cancer, both fatal and nonfatal) to the Cattaraugus Creek receptor arising from radiological discharges. This risk was calculated assuming a lifetime exposure at the peak predicted dose rate. This introduces an element of conservatism. Note also that the risk was not calculated by the simple method of taking the peak lifetime TEDE and multiplying by 6×10^{-4} LCF per rem or 0 person-rem. The risks were calculated by summing the risks for individual radionuclides using data from Federal Guidance Report 13 (EPA 1999b). **Table 4–24** shows how this risk from different WMAs varies and what it is for the entire WNYNSC for each alternative. Since the doses from which the latent cancer morbidity risk was calculated differ little between the alternatives, neither do the risks.

Table 4–24 presents results consistent with those presented in Table 4–23. It shows the radiological risk would be dominated by release from the SDA for both the Sitewide Close-In-Place Alternative and for the No Action Alternative. It also shows that the lifetime cancer risk would be within the CERCLA risk range of 1×10^{-6} to 1×10^{-4}. To put Table 4–24 in perspective, the total lifetime risk of dying of cancer from all causes is approximately 23 percent (0.23) for men and approximately 20 percent (0.2) for women (NCI 2005).

Table 4–24 Peak Lifetime Radiological Risk (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	3.6×10^{-7} (200)	0 [b]
Vitrification Facility – WMA 1	5.0×10^{-10} (500)	0 [b]
Low-Level Waste Treatment Facility – WMA 2	3.9×10^{-9} (100)	2.0×10^{-7} (100)
Waste Tank Farm – WMA 3	1.3×10^{-7} (200)	0 [b]
NDA – WMA 7	4.7×10^{-7} (6,800) [c]	4.7×10^{-7} (6,800) [c]
SDA – WMA 8	2.7×10^{-6} (33,700) [c]	2.7×10^{-6} (33,700) [c]
North Plateau Groundwater Plume	1.6×10^{-6} (79)	2.4×10^{-6} (68)
Total	2.7×10^{-6} (33,700)	2.7×10^{-6} (33,400)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that proactive maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational indefinitely. The doses from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent release from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] The predicted risks and years until peak exposure are the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

Hazardous Chemical Risk

Estimates of the risk to the Cattaraugus Creek receptor from hazardous chemicals in the NDA, SDA, the Main Plant Process Building, and the high-level radioactive waste tanks have also been prepared. Three measures were used: lifetime cancer risk, Hazard Index, and comparison to MCLs for drinking water. Tables 4–25 through 4–27 summarize this information for the WMAs having the dominant lifetime hazardous chemical risk. These estimates of lifetime cancer risk, Hazard Index, and comparison to MCLs are based on current inventory estimates. A list of the hazardous chemicals used to develop these estimates are provided in Appendix I, Table I–28, of this EIS. An explanation of how the estimates were calculated is provided in Appendix H of this EIS.

Table 4–25 shows that the lifetime cancer risk from hazardous chemicals would be very small for both alternatives, and would be dominated by the SDA. For WMA 7 and 8, the peak hazardous chemical risks are essentially the same for both alternatives when uncertainties are considered.

Table 4–25 Peak Lifetime Risk from Hazardous Chemicals (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	1.3×10^{-10} (6,000)	0 [b]
Vitrification Facility – WMA 1	5.9×10^{-11} (7,400)	0 [b]
Waste Tank Farm – WMA 3	3.1×10^{-10} (9,000)	0 [b]
NDA – WMA 7	1.3×10^{-9} (86,400)	1.3×10^{-9} (88,700)
SDA – WMA 8	2.0×10^{-8} (100)	2.1×10^{-8} (100)
Total	2.0×10^{-8} (100)	2.1×10^{-8} (100)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggests it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals. There is no hazardous chemical inventory available for the Construction and Demolition Debris Landfill in WMA 4.

[b] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs) operational indefinitely. The doses from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] The predicted risks and years until peak exposure are the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

Comparing the radiological risk information in Table 4–24 with the chemical risk information in Table 4–25, it can be seen that the lifetime cancer risk to the Cattaraugus Creek receptor would be dominated by radionuclides rather than hazardous chemicals. The radiological risk is on the order of 100 to 10,000 times greater than the chemical risk. The chemical risk is below the CERCLA risk range of 1×10^{-6} to 1×10^{-4}.

The comparison of lifetime cancer risk from radionuclides and chemicals for the Cattaraugus Creek receptor for the Sitewide Close-In-Place Alternative is shown on **Figure 4–5**. This figure shows that the greatest risk would be from radionuclides. The radionuclide risk peaks at about 40,000 years and then declines until it becomes approximately equal to the hazardous chemical risk after 100,000 years. The chemical risk increases from about 40,000 years onward as a result of the release of arsenic, which travels very slowly through the groundwater beneath the site. This general pattern is common for the No Action Alternative and for the other receptors discussed later in this section.

Another measure of chemical risk that is appropriate for noncarcinogenic chemicals is the Hazard Index for an individual receptor.[19] If the Hazard Index is greater than 1, the situation is considered to be hazardous for the receptor. **Table 4–26** presents the Hazard Index peaks for the Cattaraugus Creek receptor. As can be seen, the Hazard Index peaks are much less than 1 for both alternatives. For WMA 7 and 8, the peak hazardous chemical risks are essentially the same for both alternatives when uncertainties are considered.

[19] *The Hazard Index is defined as the sum of the hazard quotients for substances that affect the same target organ or organ system. The Hazard Quotient for a specific chemical is the ratio of the exposure to the hazardous chemical (e.g., amount ingested over a given period) to a reference value regarded as corresponding to a threshold of toxicity, or a threshold at which some recognizable health impact would appear. If the Hazard Quotient for an individual chemical or the Hazard Quotient for a group of chemicals exceeds unity, the chemical(s) may produce and adverse effect, but normally this will require a Hazard Index or Quotient of several times unity. A Hazard Index or Quotient of less than unity indicates that no adverse effects are expected over the period of exposure.*

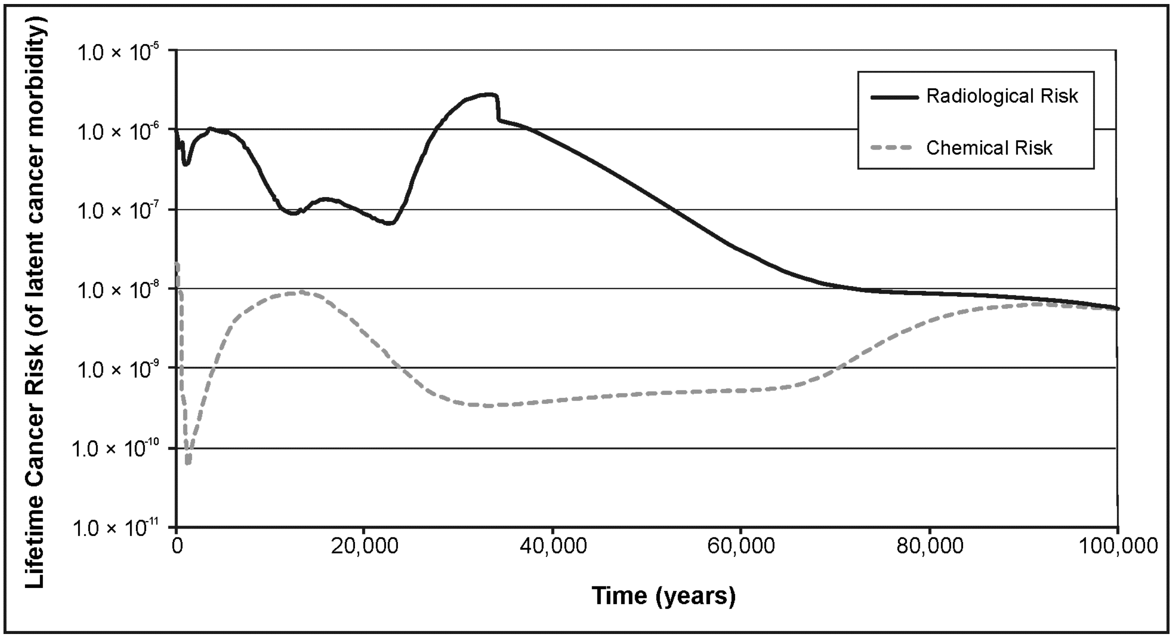

Figure 4–5 Lifetime Latent Cancer Morbidity Risk from Radionuclides and Hazardous Chemicals for the Cattaraugus Creek Receptor with the Sitewide Close-In-Place Alternative and Indefinite Continuation of Institutional Controls

Table 4–26 Peak Chemical Hazard Index for the Cattaraugus Creek Receptor (year of peak Hazard Index in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	6.7×10^{-6} (8,100)	0 [b]
Vitrification Facility – WMA 1	2.5×10^{-6} (10,100)	0 [b]
Waste Tank Farm – WMA 3	2.0×10^{-4} (12,400)	0 [b]
NDA – WMA 7	1.4×10^{-5} (30,100) [c]	1.5×10^{-5} (30,900) [c]
SDA – WMA 8	2.8×10^{-3} (4,700) [c]	2.9×10^{-3} (4,500) [c]
Total	2.9×10^{-3} (4,700)	2.9×10^{-3} (4,500)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggests it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals.

[b] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs) operational indefinitely. The health impacts of hazardous chemicals released from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] The predicted Hazard Index and years until peak exposure are almost the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

There are some hazardous chemicals for which there is no carcinogenic slope factor or reference dose, but they are recognized as hazardous materials, and MCLs have been issued under the Clean Water Act. A primary example that is relevant to WNYNSC is lead. When the inventory for a known hazardous material could be estimated, but there was no slope factor or reference dose for the material, an analysis was conducted to determine the maximum concentration of the hazardous material in the year of peak risk and the year of peak Hazard Index. **Table 4–27** shows the results of this analysis. This ratio of peak concentration to MCL would always be less than 1, and for most elements, it would be far less than 1 (less than 0.001).

Table 4–27 Chemicals with Largest Fraction of Maximum Concentration Levels in Cattaraugus Creek at Year of Peak Risk and Year of Peak Hazard Index – Indefinite Continuation of Institutional Controls [a]

Waste Management Areas [b]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Year of Peak Risk in Parentheses		
Main Plant Process Building – WMA 1	9.7×10^{-6} (55,100) Pb [d]	— [c]
Vitrification Facility – WMA 1	6.7×10^{-3} (40,500) Pb [d]	— [c]
Waste Tank Farm – WMA 3	2.0×10^{-6} (9,000) Tl [e]	— [c]
NDA – WMA 7	1.3×10^{-6} (86,700) As [f, h]	1.3×10^{-6} (89,200) As [f,, h]
SDA – WMA 8	8.3×10^{-5} (200) Usol [g]	9.0×10^{-5} (100) Usol [g, h]
Year of Peak Hazard Index in Parentheses		
Main Plant Process Building – WMA 1	9.6×10^{-6} (8,100) Pb [d]	— [c]
Vitrification Facility – WMA 1	6.7×10^{-3} (26,000) Pb [d]	— [c]
Waste Tank Farm – WMA 3	2.1×10^{-6} (12,400) Tl [e]	— [c]
NDA – WMA 7	3.4×10^{-5} (30,200) Usol [f, h]	3.4×10^{-5} (31,000) Usol [f, h]
SDA – WMA 8	7.5×10^{-3} (4,700) Usol [g, h]	7.8×10^{-3} (4,500) Usol [g, h]

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] Presented as fraction of the applicable MCL / (years until peak exposure) / chemical.

[b] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggests it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals.

[c] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs) operational indefinitely. The health impacts of hazardous chemicals released from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[d] Pb = lead, MCL (Action Level) = 0.015 milligrams per liter.

[e] Tl= thallium, MCL = 0.002 milligrams per liter.

[f] As = arsenic, MCL = 0.01 milligrams per liter.

[g] Usol = soluble uranium, MCL = 0.03 milligrams per liter.

[h] The predicted Hazard Index and years until peak exposure are almost the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

Seneca Nation of Indians Receptor

The postulated Seneca Nation of Indians receptor activities are similar to the Cattaraugus Creek receptor, but involve the consumption of a larger amount of fish (62 kilograms per year – see Appendix H, Table H–17) raised in the lower reaches of Cattaraugus Creek or in Lake Erie near the point where Cattaraugus Creek discharges into the lake. Because of bioaccumulation of radionuclides in fish at this location, the dose to this receptor is greater than that for the Cattaraugus Creek receptor. Detailed results are presented in Appendix H to this EIS (Section H.2.2.2.2). The following is a summary of results for the Seneca Nation of Indians receptor for both the Sitewide Close-In-Place Alternative and the No Action Alternative:

- The peak annual total effective dose due to groundwater releases:
  - Would be less than 25 millirem for both alternatives;
  - Would be higher than that for the Cattaraugus Creek receptor for both alternatives, due to the aforementioned consumption of fish; the peak annual total effective dose equivalent for the Seneca Nation of Indians receptor is approximately 2.4 times higher than that for the Cattaraugus Creek receptor for both the Sitewide Close-In-Place and No Action Alternatives;
  - Would occur at approximately the same time as that for the Cattaraugus Creek receptor; and

- Would be dominated by releases from the SDA for both the Sitewide Close-In-Place and No Action Alternatives.

- The peak lifetime radiological risk due to groundwater releases:
  - Would be dominated by releases from the NDA and SDA for both the Sitewide Close-In-Place and No Action Alternatives;
  - Would be within the CERCLA risk range of 1×10^{-6} to 1×10^{-4} for the Sitewide Close-In-Place Alternative, and somewhat above the upper end of that range for the No Action Alternative; and
  - Would bear much the same relationship to the Cattaraugus Creek peak lifetime radiological risk as does the peak TEDE to the Cattaraugus Creek peak TEDE (i.e., a factor of 2.8 higher).

- The dominant radionuclides would be isotopes of uranium and carbon-14 for doses via the fish pathway.

The hazardous chemical risk and Hazard Index were calculated for the Seneca Nation of Indians receptor in the same manner as they were for the Cattaraugus Creek receptor. Similar to that for the Cattaraugus Creek receptor, the hazardous chemical lifetime cancer risk would be a small fraction of the risk resulting from the estimated release of radionuclides under the same alternative, and the Hazard Index is small.

Lake Erie/Niagara River Water Users

In addition to the Cattaraugus Creek and Seneca Nation of Indians individuals, peak annual and time-integrated population dose estimates have been prepared. These are summarized in **Tables 4–28** and **4–29**, respectively. Lake Erie water users consume water taken from Sturgeon Point and several structures in the eastern channel of the Niagara River. They are assumed to drink water from Lake Erie or the Niagara River, to eat fish from Lake Erie, and (conservatively) to all be residential farmers.

Table 4–28 Peak Annual Total Effective Population Dose Equivalent (person-rem per year) for the Lake Erie Water Users (year of peak dose in parentheses) – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	1.2 (200)	0 [b]
Vitrification Facility – WMA 1	0.0065 (500)	0 [b]
Low-Level Waste Treatment Facility – WMA 2	0.0205(100)	1.5 (100)
Waste Tank Farm – WMA 3	0.66 (200)	0 [b]
NDA – WMA 7	1.1 (30,600) [c]	1.0 (31,500) [c]
SDA – WMA 8	16.9 (33,700) [c]	16.9 (33,700) [c]
North Plateau Groundwater Plume	13.7 (80)	21.5 (67)
Total	17.9 (33,600)	17.9 (33,400)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and the SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that proactive maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational indefinitely. The doses from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] The predicted population doses and years until peak exposure are approximately the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

Table 4–29 Time-integrated Total Effective Population Dose Equivalent for Lake Erie Water Users in Person-rem Over 1,000 and 10,000 years – Indefinite Continuation of Institutional Controls

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Integration Over 1,000 Years		
Main Plant Process Building – WMA 1	510	0 [b]
Vitrification Facility – WMA 1	4	0 [b]
Low-Level Waste Treatment Facility – WMA 2	9	240
Waste Tank Farm – WMA 3	140	0 [b]
NDA – WMA 7	140 [c]	140 [c]
SDA – WMA 8	600 [c]	620 [c]
North Plateau Groundwater Plume	730	1,000
Total	2,100	2,000
Integration Over 10,000 Years		
Main Plant Process Building – WMA 1	1,000	0 [b]
Vitrification Facility – WMA 1	5	0 [b]
Low-Level Waste Treatment Facility – WMA 2	37	860
Waste Tank Farm – WMA 3	270	0 [b]
NDA – WMA 7	4,100 [c]	4,400 [c]
SDA – WMA 8	29,000 [c]	29,000 [c]
North Plateau Groundwater Plume	750	1,020
Total	35,000	35,000

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and the SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that proactive maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational indefinitely. The doses from these units would be minimal as long as these engineered systems function as originally designed and institutional controls prevent releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm.

[c] The predicted population doses are approximately the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

Note: Totals may not add due to rounding.

Under the Sitewide Close-In-Place Alternative and the No Action Alternative, the predicted peak population dose of about 18 person-rem would be a very small fraction of the background radiation dose received annually by this same population. Most of the population dose shown in Table 4–28 would be received by the users of water from the Sturgeon Point intake, which would see higher radionuclide concentrations than the intake structures on the Niagara River. No credit is taken for dilution in the flow between the month of Cattaraugus Creek and the Sturgeon Point intake structure. Complete mixing in the flow of the Niagara River is assumed for water intake points in the Niagara River. The estimated annual background radiation dose for this group (565,000 people) would be approximately 200,000 person-rem. The peak annual dose of 18 person-rem for the Sitewide Close-In-Place Alternative would be less than a 0.01 percent increase over the estimated annual background radiation dose received by this group.

Table 4–29 presents the time-integrated population dose over periods of 1,000 and 10,000 years. For both alternatives, the total population dose accumulated over 10,000 years (approximately 35,000 to 36,000 person-rem) would be less than the background dose accumulated by Sturgeon Point and Niagara River users in 1 year (200,000 person-rem).

Conclusions Given Continuation of Institutional Controls

For alternatives where waste would remain on site, the overall assessment is that the dose and risk is small for both alternatives. The risk is dominated by the radiological hazards. The peak annual dose to offsite receptors is less than 25 millirem per year when considering all WMAs, regardless of the alternative.[20] The radiological hazard for both alternatives is dominated by the NDA and SDA, with the SDA presenting the largest hazard over the longest time period.

4.1.10.3.2 Conditions Assuming Loss of Institutional Control – Groundwater-Driven Releases

A loss of institutional controls is assumed to take place after 100 years. In the case of the No Action Alternative, loss of institutional controls means that all maintenance activities cease and, in particular, no effort is made to keep radionuclides confined within the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm. Conservatively, failure of containment of these facilities is assumed to take place immediately upon loss of institutional controls. For the Sitewide Close-In-Place Alternative, however, it is expected that cessation of maintenance and other activities has little effect on the rate of release of radionuclides from areas that dominate dose in this case, such as the SDA and NDA. Finally, for both alternatives, loss of institutional controls means that intruders can enter the site.

The scenarios considered in this section are: (1) loss of institutional controls leading to intruders on Buttermilk Creek; (2) loss of institutional controls leading to intruders on or adjacent to the North and South Plateaus; (3) effect of loss of institutional controls on offsite receptors; and (4) loss of institutional controls leading to an unmitigated erosion scenario.[21] All of these analyses focus on the impacts of radionuclides being released and coming in contact with human receptors. For radiological health impacts, the discussion is confined to dose impacts only (except for offsite receptors), because there are dose standards for situations following loss of institutional controls, but not risk standards.

4.1.10.3.2.1 Loss of Institutional Controls Leading to Intruders on Buttermilk Creek

Table 4–30 presents the peak annual TEDE for the Buttermilk Creek resident farmer for each alternative, assuming failure of the active controls that would detect and mitigate releases from the Main Plant Process Building, the Waste Tank Farm and the North Plateau Groundwater Plume. See Appendix H, Figure H–2, of this EIS for the location of this receptor.

All of the predicted doses for the Sitewide Close-In-Place Alternative would be less than 25 millirem per year. The No Action Alternative would result in the highest peak annual dose to this receptor (80 millirem), dominated by the Waste Tank Farm (68 millirem). If the loss of institutional controls were to occur earlier (i.e., prior to year 100), the dose would be higher because radionuclides from facilities such as the Main Plant Process Building could then migrate toward receptors and reach them sooner with less radioactive decay having taken place. For the Sitewide Close-In-Place Alternative, the SDA is the largest contributor to the long-term dose, while for the No Action Alternative, the Waste Tank Farm would dominate.

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[20] The statement that the doses are less than 25 millirem is not intended to support any regulatory conclusions. Compliance with decommissioning dose criteria is discussed in Appendix L of this EIS.
[21] Cases 1-3 consider loss of institutional controls without unmitigated erosion. Case 4 considers the case with unmitigated erosion (see Appendix H, Section H.2.2.4, of this EIS). Section H.2.2.4 also contains a qualitative discussion of the combination of doses received as a result of both erosion and releases into groundwater.

Table 4–30 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Buttermilk Creek Resident Farmer (year of peak dose in parentheses) – Loss of Institutional Controls after 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	0.15 (200)	9.9 (100)
Vitrification Facility – WMA 1	0.00062 (500)	1.7 (100)
Low-Level Waste Treatment Facility – WMA 2	0.00079 (100)	0.07 (100)
Waste Tank Farm – WMA 3	0.022 (200)	68 (100)
NDA – WMA 7	0.13 (6,800) [b]	0.14 (6,800) [b]
SDA – WMA 8	1.6 (33,800) [b]	1.6 (33,800) [b]
North Plateau Groundwater Plume	0.54 (79)	0.86 (68)
Total	1.7 (33,700)	80 (100)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] The predicted TEDEs and years until peak exposure are approximately the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

4.1.10.3.2.2 Loss of Institutional Controls Leading to Intruders in the North and South Plateaus

This section presents the estimated doses to a spectrum of intruders that could enter the site in the event of failure of institutional controls designed to limit site access. These scenarios are considered to be conservative and useful for understanding the potential magnitude of impacts if intruders come onto the plateaus. The specific intruders evaluated were: (1) direct intruder worker, (2) a resident farmer who has waste material directly deposited in his garden as a result of well drilling or home construction, and (3) a resident farmer who uses contaminated groundwater. Direct intruders are assumed to be located directly above the waste in each WMA, while contaminated groundwater is assumed to come from wells that are located approximately 100 meters (330 feet) downgradient from the edge of the waste (see Appendix H, Figure H–3, of this EIS). Additional information on these exposure scenarios is provided in Appendix D of this EIS. For the purposes of analysis of the No Action Alternative, the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm are assumed to have lost their structural integrity and collapsed after 100 years.

Intruder Worker

Two worker scenarios were considered: a well driller and a home construction worker. For the well driller, exposure pathways include inadvertent ingestion of contaminated soil, inhalation of contaminated dust, and direct exposure to contaminated water in a cuttings pond. For home construction, exposure pathways include inadvertent ingestion of contaminated soil, inhalation of contaminated dust, and exposure to external radiation from the walls of an excavation for the foundation of a home. However, the home construction scenario is not considered credible when there is a thick-engineered cap (e.g., the South Plateau burial grounds under the Sitewide Close-In-Place Alternative).

The results of this analysis are summarized in **Table 4–31**, with the results presented for the scenario with the highest TEDE.

Table 4–31 Estimated Peak Total Effective Dose Equivalent in Millirem Per Year to Intruder Worker (well driller or home construction worker) – Intrusion After 100 Years

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	Not applicable	3,890 [a, c]
Vitrification Facility – WMA 1	Not applicable	27,800 [a, c]
Low-Level Waste Treatment Facility – WMA 2	1.7 [d]	55,700 [a, c]
Waste Tank Farm – WMA 3	Not applicable	133 [d]
NDA – WMA 7	Not applicable	18,900 [a]
SDA – WMA 8	Not applicable	4,580 [a, c]
North Plateau Groundwater Plume	0 [b]	0[b]
Cesium Prong – On site	4.4 [c]	4.4 [c]
Cesium Prong – Off site	0.9 [c]	0.9 [c]

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.
[a] The doses for the No Action Alternative are very high because, in this scenario, the well driller or home construction worker intrudes directly into volumes that contain high inventories of radionuclides. In the corresponding Sitewide Close-In-Place scenarios, the concentrated inventories have been covered by a cap that is thick enough to preclude a home construction worker from reaching the remaining inventories.
[b] There would be a dose to a well driller, but it is predicted to be less than 1×10^{-8} millirem per year.
[c] Peak impact due to home construction scenarios.
[d] Peak impact due to well-drilling scenarios.

Under the Sitewide Close-In-Place Alternative, none of the predicted doses would exceed 10 millirem per year.[22] However, the No Action Alternative peak annual doses could be substantial. For the No Action Alternative, the highest dose would be for the Low-Level Waste Treatment Facility from the home construction scenario.

This analysis shows the importance of the thick, multi-layered engineered barrier in limiting the extent of direct intrusion into the waste, and thereby limiting the dose for the disposal areas under the Sitewide Close-In-Place Alternative.

Resident Farmer with Waste Material in His Garden

Table 4–32 presents the doses to the resident farmer as a result of direct contact with contamination that would be brought to the surface and placed in a garden following a well drilling or home construction scenario.

Resident Farmer Using Contaminated Groundwater

Table 4–33 presents the doses to the resident farmer whose contact with the waste would be through an indirect pathway – the use of contaminated water. The receptors for the North Plateau facilities (Main Plant Process Building, Low-Level Waste Treatment Facility, Waste Tank Farm, and North Plateau Groundwater Plume) have wells in the sand and gravel layer on the North Plateau. For the North Plateau Groundwater Plume, the peak dose for the Sitewide Close-In-Place Alternative exceeds that of the No Action Alternative because the plume moves more rapidly for the No Action Alternative. The scenario is inapplicable for the NDA and SDA receptor because of the low hydraulic conductivity of the unweathered Lavery till and the unsaturated conditions in the Kent recessional sequence.

[22] *This is merely an observation with no implied regulatory implications.*

Table 4–32 Estimated Peak Total Effective Dose Equivalent in Millirem Per Year to a Resident Farmer with a Garden Containing Contaminated Soil from Well Drilling or House Construction – Intrusion After 100 Years

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	Not applicable	7,350 [a, c]
Vitrification Facility – WMA 1	Not applicable	71,800 [a, c]
Low-Level Waste Treatment Facility – WMA 2	12 [b, d]	111,000 [a, c,]
Waste Tank Farm – WMA 3	Not applicable	2,030 [a, c]
NDA – WMA 7	Not applicable	22,600 [a, d]
SDA – WMA 8	Not applicable	2,750 [a, c]
North Plateau Groundwater Plume	0	0
Cesium Prong – On site	4.4 [c]	4.4 [c]
Cesium Prong– Off site	0.9 [c]	0.9 [c]

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] The doses for the No Action Alternative are very high because, in this scenario, the well driller or home construction worker intrudes directly into volumes that contain high inventories of radionuclides. In the corresponding Sitewide Close-In-Place scenarios, the concentrated inventories have been covered by a cap that is thick enough to preclude a home construction worker from reaching the remaining inventories.

[b] In the case of the Low-Level Waste Treatment Facility, it is possible for the well driller to penetrate soil contaminated with radioactive waste and spread radioactive material over a farmer's garden. However, the amount of material brought to the surface by a well driller is much less than that spread around during home construction.

[c] Peak impact due to home construction scenarios.

[d] Peak impact due to well-drilling scenarios.

Table 4–33 Estimated Peak Total Effective Dose Equivalent in Millirem Per Year to a Resident Farmer Using Contaminated Groundwater – Intrusion After 100 Years

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	366	36,900 [a]
Vitrification Facility – WMA 1	1.9	3,410 [a]
Low-Level Waste Treatment Facility – WMA 2	110	3,000
Waste Tank Farm – WMA 3	556	1,500,000 [a]
NDA – WMA 7	Not applicable	Not applicable
SDA – WMA 8	Not applicable	Not applicable
North Plateau Groundwater Plume	846	420
Cesium Prong – On site	4.4	4.4
Cesium Prong – Off site	0.9	0.9

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] The doses for the No Action Alternative are very high because, in this scenario, the well intrudes directly into volumes that contain high inventories of radionuclides. The cap prevents direct intrusion into the waste, and the slurry wall and cap limit flow of water through the waste.

The results for the No Action Alternative clearly show that serious consequences are possible should facilities like the Main Plant Process Building or the Waste Tank Farm be abandoned. The results also show the high potential consequences for both alternatives in the event of intrusion over the North Plateau Groundwater Plume.

The time series of dose for the North Plateau Groundwater Plume under the Sitewide Close-In-Place Alternative is presented in **Figure 4–6** for receptors at 100 and 300 meters from the source of the Plume. The figure illustrates how sensitive the dose is to the time at which the intrusion occurs, and to where the intruder places his farm. The peak dose in Table 4–33 from the North Plateau Groundwater Plume for the Sitewide

Close-In-Place Alternative comes from the receptor at 300 meters at 100 years. The distance of 100 meters (330 feet) is in the vicinity of the peak concentration of the Plume at the first year of the period of analysis for both the No Action and Sitewide Close-In-Place Alternatives, and just outside of the down-gradient slurry wall for the Sitewide Close-In-Place Alternative. The distance of 300 meters (980 feet) is located just up-gradient of the North Plateau drainage ditch, the first location of discharge of the Plume to the surface. For each alternative, the peak onsite concentration would occur during the period of institutional controls when a receptor could not access the contaminated groundwater. As time proceeds, the radionuclide concentration in the Plume decreases at locations near the source and increases and then decreases at locations further removed from the source. This behavior explains the occurrence of peak dose at a location removed from the original source for an analysis time of 100 years.

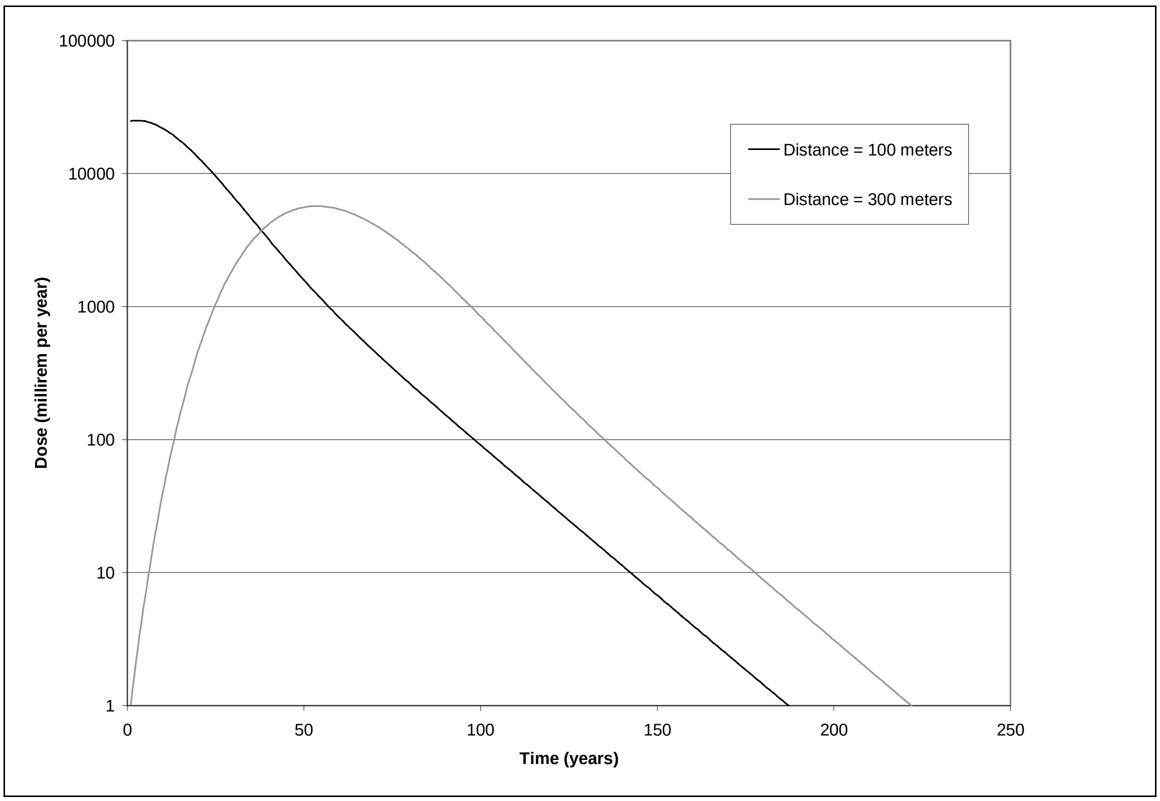

Figure 4–6 Time Series of Dose for Onsite Receptors for North Plateau Groundwater Plume Under Sitewide Close-In-Place – Time Measured from Completion of Decommissioning

Dose from Multiple Sources

The previous discussion presented information on the dose to various receptors from individual WMAs. There is the potential for receptors to come in contact with contamination from multiple areas and therefore receive higher doses than would be received from a single WMA. The highest doses are home construction intruders for the No Action Alternative (Table 4–31), a resident farmer with contamination from home construction for the No Action Alternative (Table 4–32), and a resident farmer using contaminated groundwater for either the Sitewide Close-In-Place Alternative or the No Action Alternative (Table 4–33).

The greatest potential for a dose from multiple sources for the No Action Alternative would be the combination of a garden contaminated with material from home construction and irrigated with contaminated groundwater. These combinations could result in peak doses approaching 100,000 millirem, or even higher if the well were located near the Waste Tank Farm.

4.1.10.3.2.3 Effect of Loss of Institutional Controls on Offsite Receptors

This section is parallel to Section 4.1.10.3.1, which presented the results of the long-term performance assessment for offsite receptors assuming indefinite continuation of institutional controls (but with no erosion, which is considered in Section 4.1.10.3.3). However, in this section, it is assumed that institutional controls would be lost after 100 years (i.e., site maintenance activities would cease). In particular, it is assumed that there would be no more efforts to contain radionuclides and hazardous chemicals within WMAs on the North and South Plateaus. Conservatively, these are assumed to fail as soon as institutional controls fail. This section re-examines the analysis for the offsite receptors.

The principal effect of allowing releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm is to considerably increase predicted doses and risks for the No Action Alternative. However, the predicted doses and risks for the Sitewide Close-In-Place Alternative are barely changed because the engineered features that would be put in place around and above (for example) the NDA and SDA would be little affected by the cessation of maintenance. Therefore, the discussion in Section 4.1.10.3.2.3 focuses on the No Action Alternative. Tabular results for the Sitewide Close-In-Place Alternative are included for comparison.

Cattaraugus Creek Receptor

As described previously, the Cattaraugus Creek receptor is a postulated offsite receptor who is closest to the site boundary and receives the impact of liquid release from all portions of the site. This receptor is conservatively assumed to drink water from Cattaraugus Creek, eat local fish and deer, and irrigate his garden with water from Cattaraugus Creek.

Figure 4–7 presents the annual TEDE as a function of time to the Cattaraugus Creek receptor for the No Action Alternative. See Figure 4–4 for the comparable plot for the No Action Alternative with indefinite continuation of institutional controls.

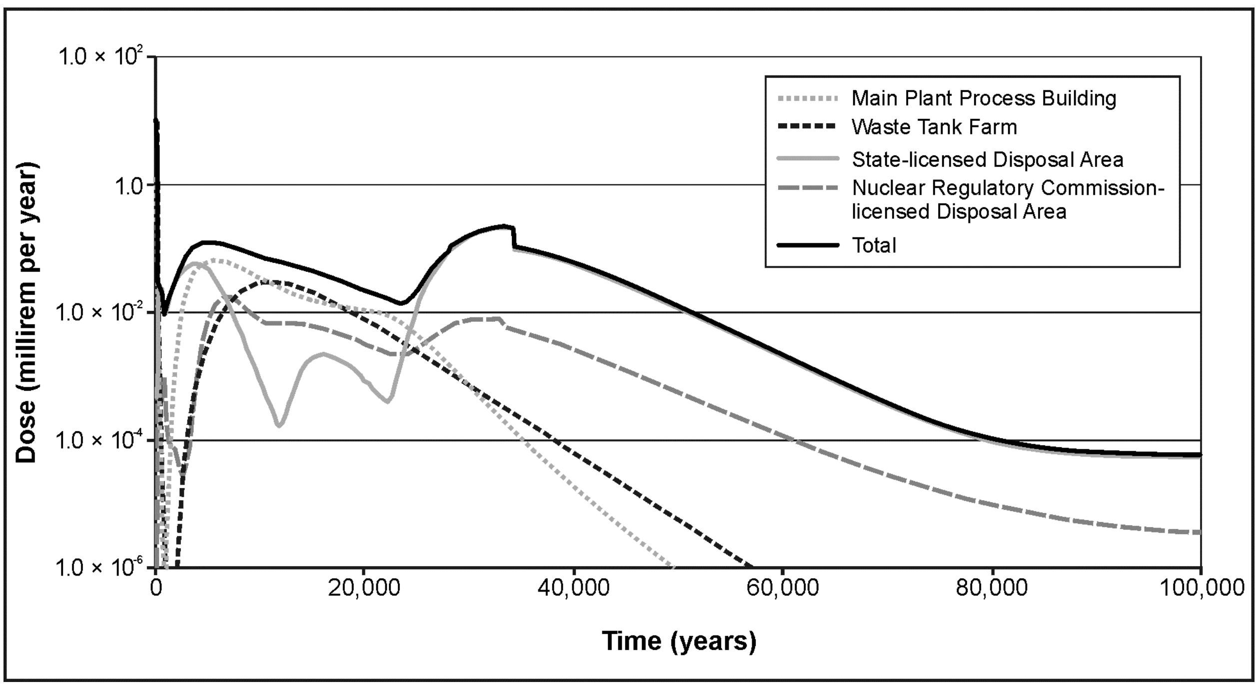

Figure 4–7 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor for the No Action Alternative with Loss of Institutional Controls After 100 Years

The figures show a number of peaks that correspond to the arrival of "pulses" of radionuclides from different areas on the site. This is further clarified by **Table 4–34**, which, for each alternative, displays the WMA, the predicted peak annual TEDE arising from radionuclides leaching from the WMA, and the predicted years until peak annual TEDE.

Table 4–34 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Cattaraugus Creek Receptor (year of peak exposure in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	0.019 (200)	1.3 (100) [b]
Vitrification Facility – WMA 1	0.000082 (500)	0.23 (100) [b]
Low-Level Waste Treatment Facility – WMA 2	0.0092 (100)	0.026 (100)
Waste Tank Farm – WMA 3	0.0029 (200)	8.9 (100) [b]
NDA – WMA 7	0.018 (6,800) [c]	0.018 (6,800) [c]
SDA – WMA 8	0.21 (33,800) [c]	0.21 (33,800) [c]
North Plateau Groundwater Plume	0.072 (79)	0.11 (68)
Total	0.22 (33,700)	10 (100)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational for 100 years. The doses from these units would be minimal as long as these engineered systems function as originally designed.

[c] The predicted population doses and years until peak exposure are approximately the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

The results presented in Table 4–34 show that the total peak annual dose to the Cattaraugus Creek receptor due to groundwater releases would still be below 25 millirem per year for both alternatives. However, whereas in Table 4–23 the predicted total doses for the two alternatives were about the same, the dose for the No Action Alternative is now 40 to 50 times larger. For the No Action Alternative, the peak annual dose would be dominated by the Waste Tank Farm and occurs at approximately 100 years. The dominant radionuclide from the Waste Tank Farm is strontium-90 in drinking water. The doses for the Sitewide Close-In-Place Alternative are much the same as they were for indefinite continuation of institutional controls, reflecting the fact that the conservative assumptions in the model mean that the maintenance or cessation of institutional controls make little difference to how rapidly, for example, radionuclides enter groundwater in the SDA and are then transported to Franks Creek or Erdman Brook.

Table 4–35 shows the peak risk of latent cancer morbidity to the Cattaraugus Creek receptor arising from radiological discharges. It also shows how this risk varies from different WMAs and what it is for contributions from the entire WNYNSC for each alternative. As expected, this table closely parallels the dose table, Table 4–34. Releases from the Main Plant Process Building, the Vitrification Facility, and the Waste Tank Farm increase the predicted lifetime risk of cancer fatality by about a factor of 100 to ~ 2.3×10^{-4}. It also shows that the lifetime cancer risk would be above the CERCLA risk range of 1×10^{-6} to 1×10^{-4}.

Table 4–36 shows the peak lifetime cancer risk from chemical exposure broken down by WMA. In contrast to radiological doses, the additional releases from the Main Plant Process Building and Waste Tank Farm that occur in the case of the No Action Alternative do not cause a large increase in risk. This is because, when thinking purely of chemicals, inventories of hazardous chemicals are much larger and more mobile in the NDA and SDA than in the buildings and tanks.[23] As was the case for indefinite continuation of institutional controls, the chemical risks are a small fraction of the radiological risks, except for times approaching 100,000 years.

Detailed calculations also confirm that, for loss of institutional controls after 100 years, the Hazard Index and the fraction of MCL both remain less than unity.

Table 4–35 Peak Lifetime Radiological Risk (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	3.6×10^{-7} (200)	2.8×10^{-5} (100) [b]
Vitrification Facility – WMA 1	5.0×10^{-10} (500)	5.0×10^{-6} (100) [b]
Low-Level Waste Treatment Facility – WMA 2	3.9×10^{-9} (100)	2.0×10^{-7} (100)
Waste Tank Farm – WMA 3	1.3×10^{-7} (200)	1.9×10^{-4} (100) [b]
NDA – WMA 7	4.7×10^{-7} (6,800) [c]	4.7×10^{-7} (6,800) [c]
SDA – WMA 8	2.7×10^{-6} (33,700) [c]	2.7×10^{-6} (33,700) [c]
North Plateau Groundwater Plume	1.6×10^{-6} (79)	2.4×10^{-6} (68)
Total	2.7×10^{-6} (33,700)	2.3×10^{-4} (100)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.
[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.
[b] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational for 100 years. The risks from these units would be minimal as long as these engineered systems function as originally designed.
[c] The predicted risks and years until peak exposure are the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

Table 4–36 Peak Lifetime Risk from Hazardous Chemicals (risk of latent cancer morbidity) for the Cattaraugus Creek Receptor (year of peak risk in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	1.3×10^{-10} (6,000)	2.9×10^{-9} (4,200) [b]
Vitrification Facility – WMA 1	5.9×10^{-11} (7,400)	1.0×10^{-9} (4,300) [b]
Waste Tank Farm – WMA 3	3.1×10^{-10} (9,000)	1.0×10^{-9} (2,600) [b]
NDA – WMA 7	1.3×10^{-9} (86,400) [c]	1.3×10^{-9} (88,700) [c]
SDA – WMA 8	2.0×10^{-8} (100) [c]	2.1×10^{-8} (100) [c]
Total	2.0×10^{-8} (100)	2.1×10^{-8} (100)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.
[a] The limited information available on hazardous chemical inventories in the Low-Level Waste Treatment Facility suggests it would not make a noticeable contribution to the overall long-term risk from hazardous chemicals.
[b] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational for 100 years. The risk from these units would be minimal as long as these engineered systems function as originally designed.
[c] The predicted risks and years until peak exposure are the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

[23] *Note that, in general, organic chemicals experience less retardation than radionuclides. The controlling constituent of the NDA impact is more strongly retarded than that for the SDA impact, which is why the SDA peak occurs much earlier than the NDA peak. Note also that degradation of organic compounds is not addressed.*

Seneca Nation of Indians Receptor

As described above for the case where institutional controls remain in place, the timing of the peak annual dose to the Seneca Nation of Indians receptor for the case when institutional controls fail after 100 years is similar to the Cattaraugus Creek receptor, but the Seneca Nation of Indians receptor dose is larger because the Seneca Nation of Indians receptor is postulated to consume a larger amount of fish (62 kilograms per year) raised in the lower reaches of Cattaraugus Creek or in Lake Erie near the point where Cattaraugus Creek discharges into the lake. Detailed results are presented in Appendix H, Section H.2.2.3.3, of this EIS (Tables H–54 through H–57). The following is a summary of those results for the Seneca Nation of Indians receptor in the case of the No Action Alternative.

- The peak annual total effective dose due to groundwater releases:
  - Would be still less than 25 millirem;
  - Would be slightly higher than that of the Cattaraugus Creek receptor (about a factor of 1.3);
  - Would occur at approximately the same time as for the Cattaraugus Creek receptor; and
  - Would be dominated by the Waste Tank Farm.
- The peak lifetime radiological risk of latent cancer morbidity due to groundwater releases:
  - Would be dominated by the Waste Tank Farm;
  - Would be approximately 3×10^{-4} above the CERCLA risk range of 1×10^{-6} to 1×10^{-4} for the Sitewide Close-In-Place Alternative, and somewhat above the upper end of that range for the No Action Alternative; and
  - Would bear much the same relationship to the Cattaraugus Creek peak lifetime radiological risk as does the peak TEDE to the Cattaraugus Creek peak TEDE (i.e., somewhat higher).
- The dominant radionuclides would be strontium-90 via fish (as opposed to strontium-90 via drinking water at Cattaraugus Creek).

The latent cancer morbidity risk from hazardous chemicals would be very much smaller than that from radioactive materials except approaching 100,000 years. The hazard indices and fractions of MCL remain less than unity.

As with the Cattaraugus Creek receptor, the dose to the Seneca Nation of Indians receptor for the Sitewide Close-In-Place Alternative with loss of institutional controls after 100 years is similar to that for indefinite continuation of institutional controls because the movement of contamination for the Sitewide Close-In-Place Alternative is not controlled by features that are sensitive to the presence or loss of institutional controls.

Lake Erie/Niagara River Water Users

Table 4–37 presents the peak annual total effective population dose equivalent for Lake Erie water users. **Table 4–38** presents the total effective population dose equivalent integrated over 1,000 and 10,000 years.

Table 4–37 Peak Annual Total Effective Population Dose Equivalent in Person-Rem per Year for Lake Erie/Niagara River Water Users (year of peak dose in parentheses) – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Main Plant Process Building – WMA 1	1.2 (200)	238 (100) [b]
Vitrification Facility – WMA 1	0.0065 (500)	44.3 (100) [b]
Low-Level Waste Treatment Facility – WMA 2	0.02 (100)	1.5 (100)
Waste Tank Farm – WMA 3	0.66 (200)	1,726 (100) [b]
NDA – WMA 7	1.1 (30,600) [c]	1.0 (31,500) [c]
SDA – WMA 8	16.9 (33,700) [c]	16.9 (33,700) [c]
North Plateau Groundwater Plume	13.7 (80)	21.5 (67)
Total	17.9 (33,600)	2,020 (100)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs, etc.) operational for 100 years. The risks from these units would be minimal as long as these engineered systems function as originally designed.

[c] The predicted TEDEs and years until peak exposure are approximately the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

As described previously, most of the population dose shown in Table 4–37 would be received by the users of water from the Sturgeon Point intake, which would see higher radionuclide concentrations than the intake structures on the Niagara River. The estimated annual background radiation dose for this group (565,000 people) would be approximately 200,000 person-rem. The peak annual dose of 18 person-rem for the Sitewide Close-In-Place Alternative would be less than a 0.01 percent increase over the estimated annual background radiation dose received by this group, while the peak annual dose of 2,000 person-rem for the No Action Alternative would contribute about 1 percent.

Table 4–38 presents the time-integrated population dose over periods of 1,000 and 10,000 years. For the Sitewide Close-In-Place Alternative, the total population dose accumulated over 10,000 years (35,000 person-rem) would be less than the background dose by Sturgeon Point users in 1 year (203,000 person-rem).

The background radiation dose to Sturgeon Point water users over 10,000 years would be an estimated 2 billion person-rem, compared to the maximum projected dose of 395,000 person-rem for the No Action Alternative.

4.1.10.3.3 Conditions Assuming Loss of Institutional Control – Erosion-Driven Releases

Because erosion is recognized as a site phenomenon, a bounding scenario of unmitigated erosion is analyzed to estimate the dose to various receptors. For the purposes of this analysis, unmitigated erosion is defined to mean that credit is not taken for the presence of erosion control structures or performance monitoring and maintenance of any kind. Predictions of unmitigated erosion for thousands of years into the future were developed with the help of landscape evolution models that were calibrated to reproduce both historical erosion rates and current topography, starting from the topography estimated to exist after the last glacial recession. The development of the unmitigated erosion estimate is discussed in Appendix F of this EIS. The chosen erosion scenario for the landscape evolution model corresponds to a case in which the site becomes partly forested and partly grassland.

Table 4–38 Time-integrated Total Effective Population Dose Equivalent for Lake Erie/Niagara River Water Users in Person-Rem Over 1,000 and 10,000 Years – Loss of Institutional Controls After 100 Years

Waste Management Areas [a]	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
Integration over 1,000 years		
Main Plant Process Building – WMA 1	510	25,000 [b]
Vitrification Facility – WMA 1	4	4,900 [b]
Low-Level Waste Treatment Facility – WMA 2	9	520
Waste Tank Farm – WMA 3	140	220,000 [b]
NDA – WMA 7	140 [c]	140 [c]
SDA – WMA 8	600 [c]	620 [c]
North Plateau Groundwater Plume	730	1,000
Total	2,100	252,000
Integration over 10,000 years		
Main Plant Process Building – WMA 1	1,000	130,000 [b]
Vitrification Facility – WMA 1	5	5,000 [b]
Low-Level Waste Treatment Facility – WMA 2	9	2,400
Waste Tank Farm – WMA 3	270	223,000 [b]
NDA – WMA 7	4,100 [c]	4,400 [c]
SDA – WMA 8	29,000 [c]	29,000 [c]
North Plateau Groundwater Plume	750	1,020
Total	35,000	395,000

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

[a] For WMAs 1 through 3, the contributions to dose are presented for the key facilities that contain almost all of the radioactive materials in the WMA. However, no single facility characterizes the burial grounds, so the NDA (WMA 7) and the SDA (WMA 8) are presented as entities in their own right. Other WMAs are not sources of radioactive materials.

[b] It is assumed that maintenance actions would keep engineered systems (caps, drying systems, roofs) operational for 100 years. The doses from these units would be minimal as long as these engineered systems function as originally designed.

[c] The predicted population doses are approximately the same for the Sitewide Close-In-Place and No Action Alternatives because it is assumed that the effectiveness of any caps and other mitigating features in the Sitewide Close-In-Place Alternative degrades immediately so that groundwater flow rates and leaching rates are essentially the same for both alternatives.

Note: Totals may not add due to rounding.

The modeling described in this section considers only erosion of the Low-Level Waste Treatment Facility on the North Plateau and of the SDA and NDA on the South Plateau. The landscape evolution model predicts very little erosion in the region of the Main Plant Process Building, Vitrification Facility, and Waste Tank Farm, and also predicts that the only places where any serious erosion would be expected in the foreseeable future would be in the vicinities of the Low-Level Waste Treatment Facility, SDA, or NDA. To establish an upper bound on the potential impacts, the simplified single gully model described in Appendix G of this EIS was used to estimate rate of soil loss for the Low-Level Waste Treatment Facility, NDA, and SDA. Conservative estimates of gully advance rate (0.7 meters [2.3 feet] per year for the North Plateau and 0.4 meters [1.2 feet] per year for the South Plateau), downcutting rate (0.058 meters [0.19 feet] per year) and stable slope angle (21 degrees) were used in the analysis. The results of the analysis indicate that, for both the No Action and Sitewide Close-In-Place Alternatives, waste is completely removed from the Low-Level Waste Treatment Facility, NDA, and SDA in approximately 200, 990, and 1,900 years, respectively.

A spectrum of erosion-related receptors was examined: (a) three residents,[24] one on the west bank of Erdman Brook south of the Low-Level Waste Treatment Facility, one on the east bank of Franks Creek opposite the SDA, and one on the west bank of Erdman Brook opposite the NDA, each of whom would be subject to direct shine from the eroded opposite bank and would spend some time hiking about the site; (b) a resident farmer along Buttermilk Creek; and (c) the same offsite receptors evaluated for the case of continuation of institutional controls – Cattaraugus Creek, Seneca Nation of Indians, and Lake Erie/Niagara River Water users.

Low-Level Waste Treatment Facility/NRC-licensed Disposal Area/State-licensed Disposal Area Resident/Recreational Hiker

Table 4–39 presents the peak annual TEDE for the resident/recreational hiker for the Low-Level Waste Treatment Facility, NDA, and SDA for each alternative if unmitigated erosion of the site were allowed to take place. The table also shows the years until peak annual dose. The assumptions governing the behavior and exposure of the recreational hiker are given in Appendix H, Table H–5, of this EIS. Exposure modes as a hiker include inadvertent ingestion of soil, inhalation of fugitive dust, and exposure to direct radiation. This receptor does not ingest radionuclides through food and water pathways.

Table 4–39 Peak Annual Total Effective Dose Equivalent in Millirem Per Year to a Resident/Recreational Hiker on the Low-Level Waste Treatment Facility, NDA, and SDA (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	10 (500)	10 (325)
SDA – WMA 8	11 (375)	12 (375)
Low-Level Waste Treatment Facility – WMA 2	36 (122)	104(100)
Total	36 (122)	104 (100)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

The predicted results are quite similar for the Sitewide Close-In-Place and the No Action Alternatives. Because of conservative assumptions in the erosion model, the engineered cap only slightly reduces the rate of erosion for the Sitewide Close-In-Place Alternative. No credit is taken for stream erosion controls for the erosion resistance of the rock along the side of the engineered cap. Additional detail on the erosion release model is provided in Appendix G of this EIS.

Buttermilk Creek Resident Farmer

Table 4–40 presents the peak annual TEDE from the eroded Low-Level Waste Treatment Facility, NDA, and SDA for the Buttermilk Creek resident farmer for the unmitigated erosion scenario. See Appendix H, Section H.1.3.1, of this EIS, for a discussion of the location of the Buttermilk Creek resident farmer. The table also shows the years until peak annual dose.

The relationship between the doses for the Sitewide Close-In-Place Alternative and the No Action Alternative would be much the same as for the resident/recreational hiker. However, the predicted doses would be higher because of the greater number of exposure pathways for a resident farmer as opposed to a resident/recreational hiker only.

[24] The onsite resident differs from the onsite resident farmer in that the former has no garden and does not drink contaminated water. See Appendix H, Figure H–3, of this EIS, for the locations of these three receptors.

Table 4–40 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Buttermilk Creek Resident Farmer (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	342 (725)	358 (650)
SDA – WMA 8	87 (625)	89 (600)
Low-Level Waste Treatment Facility – WMA 2	16 (156)	36 (103)
Total	421 (725)	443 (650)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

Cattaraugus Creek Receptor

Table 4-41 presents the peak annual TEDE from the Low-Level Waste Treatment Facility, NDA, and SDA for the Cattaraugus Creek resident farmer for the unmitigated erosion scenario.

The doses to the Cattaraugus Creek receptor, if unmitigated erosion were allowed to progress at WNYNSC, show a similar pattern to that seen for the Buttermilk Creek intruder, but the doses would be generally lower by a factor of 5 to 10.

Table 4–41 Peak Annual Total Effective Dose Equivalent in Millirem Per Year for the Cattaraugus Creek Receptor (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	45 (725)	47 (650)
SDA – WMA 8	12 (625)	12 (600)
Low-Level Waste Treatment Facility – WMA 2	2 (156)	5 (103)
Total	56 (725)	58 (650)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

An illustration of how the peak annual dose to the Cattaraugus Creek receptor would vary as a function of time for the Sitewide Close-In-Place Alternative is presented in **Figure 4–8**. The variations for the No Action Alternative are almost identical. The variations for the Buttermilk Creek farmer (provided earlier) and the Seneca Nation of Indians receptor (in this section) have the same shape, although the peaks are not of the same magnitude. The plot cuts off at about 2,000 years because all of the available radioactive material would have been eroded by that time.

Seneca Nation of Indians Receptor

As described previously, a Seneca Nation of Indian receptor is postulated to use Cattaraugus Creek near Gowanda for drinking water and is also postulated to consume large quantities of fish raised in these waters. The peak annual dose for this receptor is presented in **Table 4–42**.

The timing of the dose peaks for the Seneca Nation of Indians receptor, in the event of unmitigated erosion at WNYNSC, show a similar pattern to that seen for the Cattaraugus Creek receptor, but the numerical values of the dose peaks would be higher by a factor of about 2 as a result of the higher assumed level of fish consumption.

Lake Erie Water Users

Peak annual and time-integrated population dose estimates have been prepared for the unmitigated erosion release scenario. These are summarized in **Tables 4–43** and **4–44**, respectively.

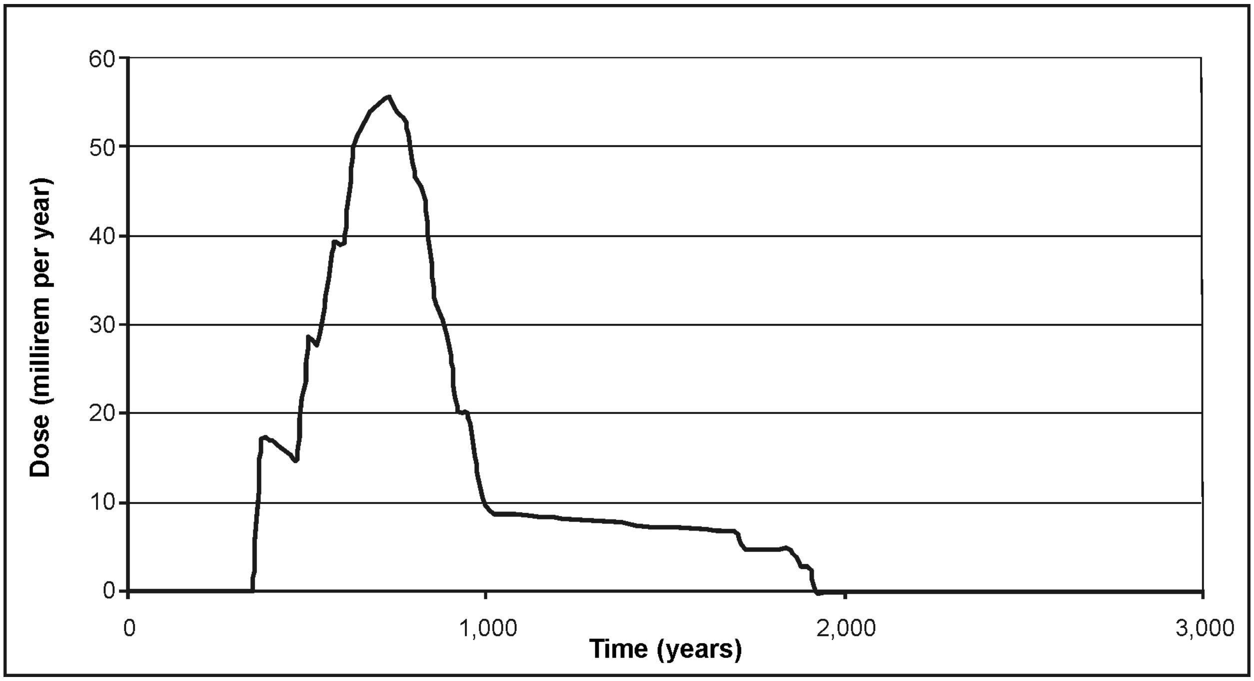

Figure 4–8 Annual Total Effective Dose Equivalent for the Cattaraugus Creek Receptor as a Function of Time with the Sitewide Close-In-Place Alternative and Unmitigated Erosion

Table 4–42 Peak Annual Total Effective Dose Equivalent in Millirem Per Year to the Seneca Nation of Indians Receptor (year of peak exposure in parentheses) – Unmitigated Erosion

Waste Management Areas	*Sitewide Close-In-Place Alternative*	*No Action Alternative*
NDA – WMA 7	107 (725)	112 (650)
SDA – WMA 8	17 (625)	18 (375)
Low-Level Waste Treatment Facility – WMA 2	4 (156)	9 (103)
Total	122 (725)	129 (650)

NDA = NRC-licensed Disposal Area, SDA = State-licensed Disposal Area, WMA = Waste Management Area.

Table 4–43 Peak Annual Total Effective Dose Equivalent Population Dose in Person-rem Per Year to the Lake Erie Water Users (year of peak exposure in parentheses) - Unmitigated Erosion

	Sitewide Close-In-Place Alternative	*No Action Alternative*
Unmitigated Erosion	5,800 (725)	6,100 (650)

Table 4–44 Time-integrated Total Effective Population Effective Dose Equivalent in Person-rem to the Lake Erie Water Users - Unmitigated Erosion

	Sitewide Close-In-Place Alternative	*No Action Alternative*
Integration over 1,000 years	2,200,000	2,300,000
Integration over 10,000 years	3,300,000	3,400,000

As described previously, most of this population dose would be received by the estimated 565,000 individuals using water from the Sturgeon Point intake. Using an average background dose rate of 360 millirem per year, the annual background population dose for this community would be approximately 200,000 person-rem. The peak annual population dose for the Sitewide Close-In-Place Alternative (5,800 person-rem per year) and the No Action Alternative (6,100 person-rem per year) would both be about 3 percent of the annual background dose.

Additional perspective is provided by the cumulative population dose at 1,000 and 10,000 years. For comparison, the background population dose accumulated by Sturgeon Point water users would be approximately 200 million person-rem over 1,000 years, and 2 billion person-rem over 10,000 years. As shown in Table 4–44, the additional population doses accumulated from WNYNSC would be relatively small.

Conclusions for Loss of Institutional Controls Leading to Unmitigated Erosion

The results for unmitigated erosion of the SDA, NDA, and Low-Level Waste Treatment Facility for the Sitewide Close-In-Place Alternative show annual TEDEs of up to about 36 millirem for the resident hiker, 421 millirem for the Buttermilk Creek resident farmer, 56 millirem for the Cattaraugus Creek receptor, and 122 millirem for the Seneca Nation of Indians receptor. For the two offsite receptors, these represent an increase by a factor of about 200 over the case of no unmitigated erosion. The results for the No Action Alternative are only slightly higher than those for the Sitewide Close-In-Place Alternative because, under the conservative assumptions of the erosion model, the engineered safety cap only slightly reduces the rate of erosion for the Sitewide Close-In-Place Alternative.

Integrated Groundwater/Erosion Model

In the foregoing analysis, groundwater releases and erosion releases (i.e., particulate matter washed into rivers and streams) are modeled separately. At the present time, integrated models of groundwater releases and erosion releases are beyond the state-of-the art. This question is addressed in sensitivity studies in Appendix H, Section H.3. However, as noted above, dose impacts to offsite receptors are about 200 times greater in the erosion scenarios than they are in the groundwater release scenarios. Therefore, intuitively, the combined model would be expected to predict doses much greater than those already predicted by the stand-alone erosion model.

4.1.10.4 Conclusions for Potential Long-term Impacts of the Phased Decisionmaking Alternative

At the conclusion of Phase 1 of the Phased Decisionmaking Alternative, the status of facilities and areas on the site would be as follows:

- The plume source volume for the Main Plant Process Building and the Vitrification Facility would be completely removed. Therefore, these two structures would contribute negligibly to potential health impacts under any final disposition of the site.
- All buildings in WMA 2 would be removed except the permeable treatment wall, which would be replaced if necessary. Lagoons 1, 2, and 3 would be removed with excavations extending 0.6 meter (2 feet) into the Lavery till. The liners and underlying berms for Lagoons 4 and 5 would be removed, as would the North Plateau Groundwater Recovery System associated with the North Plateau Groundwater Plume. These Proposed Actions would greatly reduce the inventory of radioactive materials and hazardous chemicals in WMA 2.
- The Waste Tanks in the Waste Tank Farm would remain in place.

- The NDA and SDA would be under monitoring and/or active management as at the present time.
- The source area of the North Plateau Groundwater Plume would be removed. The nonsource area of the North Plateau Groundwater Plume would be contained by the permeable reactive barrier and permeable treatment wall installed before the starting point of this EIS.
- The Cesium Prong would be managed by continuing restrictions on use and access, the same as that for the No Action and Sitewide Close-In-Place Alternatives.

Phase 2

- If the Phase 2 decision were removal, the long-term impacts for the entire Phased Decisionmaking Alternative would be comparable to those for the Sitewide Removal Alternative (i.e., the maximum dose to any potential future site user would be less than 25 millirem per year, and the impacts to offsite water users would be very small).
- If the Phase 2 decision were close-in-place for the remaining units (Waste Tank Farm, NDA, and SDA), the long-term impacts for the Phased Decisionmaking Alternative would be bounded by those for the Sitewide Close-In-Place Alternative for the NDA, SDA, North Plateau Groundwater Plume, and Cesium Prong, but overall would be less than those for the Sitewide Close-In-Place Alternative because of the removal of the Main Plant Process Building and the Vitrification Facility.

4.1.11 Waste Management

Depending on the alternative, decommissioning and construction and operation of facilities would generate several types of waste including nonhazardous, hazardous, low-level radioactive, mixed low-level radioactive, and transuranic waste. Definitions for the various waste types are provided in Chapter 3, Section 3.13.1, of this EIS.

Waste management impacts were assessed by comparing the projected waste volumes generated under each alternative to current waste management practices and to the volumes of waste being managed from ongoing activities at WNYNSC. Ongoing activities include waste treatment, storage and disposal as evaluated in the *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* (DOE/EIS-0337F) (DOE 2003e) and Supplement Analysis (DOE/EIS-0337-SA-01) (DOE 2006b); disposal of 36 surplus facilities as evaluated in the *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project*, (DOE/EA-1552) (DOE 2006c); and completion of certain actions described in Chapter 2, Section 2.3.1, of this EIS, representing the starting point for this EIS. **Table 4–45** presents a summary of the waste management impacts for the four EIS alternatives.

As described in Chapter 2 of this EIS, under the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking (Phase 1) Alternatives, new facilities would be constructed to manage some of the waste. The environmental impacts of construction, operation, and deactivation of these new waste management facilities are evaluated in the applicable environmental and social resources sections of this chapter.

4.1.11.1 Waste Volumes

Large volumes of waste, much of which radioactive, are expected to be generated and processed for disposal during decommissioning of WNYNSC.

Table 4–46 compares the packaged waste volumes generated by the four EIS alternatives. The table is divided into two sections. The upper section of the table shows the volumes of wastes that would need to be processed and disposed of under the DOE/Commercial Disposal Option (DOE low-level radioactive waste is disposed of at DOE disposal facilities while commercial low-level radioactive waste is disposed of at commercial disposal facilities). The lower section of the table shows the volumes of wastes that would need to be processed and disposed of under the Commercial Disposal Option (all low-level radioactive waste is disposed of at commercial facilities). Note that the packaged volumes vary because of the waste acceptance criteria of the waste disposal facilities. For example, DOE wastes that would be equivalent to Class B and C wastes under NRC regulations that would be disposed of at DOE disposal facilities are assumed to be packaged in B-25 boxes or 208-liter (55-gallon) drums, whereas commercial facilities are assumed to require packaging in high integrity containers (HICs).

Table 4–47 compares the packaged waste volumes generated by the activities performed under the three decommissioning alternatives for site monitoring and maintenance or long-term stewardship. These wastes are presented on an annual basis to allow comparison with each other and the No Action Alternative.

4.1.11.2 Management Options

There are a variety of disposal options available for the different types of wastes to be processed under the alternatives. Different disposal options may be available (i.e., whether the waste in question comes from an area that is a DOE responsibility or one that is a NYSERDA responsibility). **Table 4–48** presents these options by waste type.

Any nonhazardous solid waste generated during decommissioning and/or site monitoring and maintenance or long-term stewardship activities would be packaged and transported in conformance with standard industrial practices. Solid waste, such as uncontaminated metal items that can be recycled, would be sent off site for that purpose. The remaining debris derived from demolition of uncontaminated structures would be packaged in roll-off containers for transport to an offsite permitted commercial or municipal disposal facility in accordance with 6 New York Code of Rules and Regulations (NYCRR) 360-7 (WSMS 2008e). Trash, such as waste paper generated from routine office work, is not included in the nonhazardous waste estimates (WSMS 2008a).

Hazardous waste would be packaged in U.S. Department of Transportation (DOT)-approved containers in a manner appropriate to the specific waste type, and shipped off site to permitted commercial recycling, treatment, and disposal facilities. The hazardous waste would be accumulated for less than 90 days. Therefore, long-term hazardous waste storage facilities would not be required.

Table 4–45 Summary of Waste Management Impacts

Activity	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Packaged Decommissioning Waste (cubic meters)				
Nonhazardous	120,000	15,000	35,000	0
Hazardous	18	3	2	0
LLW [a]	1,500,000	10,000	170,000	0
GTCC [a]	4,200	0	0	0
TRU [a]	1,000	39	710	0
MLLW	570	410	41	0
Total [b]	1,600,000	26,000	210,000	0
Impacts	Nonhazardous waste, Class A low-level radioactive waste (including low specific activity waste), and Greater-Than-Class C waste exceed the volumes being managed from ongoing activities.[c] Nonhazardous waste is common demolition debris that would have no adverse impact on commercial disposal facilities. Much of the low-level radioactive waste is low specific activity waste that would have no adverse impact on DOE or commercial disposal facilities.	All waste volumes would be less than the volumes being managed from ongoing activities.[c]	Nonhazardous waste and Class A low-level radioactive waste generated during Phase 1 (including low specific activity waste) would exceed the volumes being managed from ongoing activities.[c] Nonhazardous waste is common demolition debris that would have no adverse impact on commercial disposal facilities. Much of the low-level radioactive waste is low specific activity waste that would have no adverse impact on DOE or commercial disposal facilities. If Phase 2 results in removal of the remaining underground structures and wastes, the total decommissioning waste volumes generated for the entire Phased Decisionmaking Alternative would be very similar to those generated under the Sitewide Removal Alternative. If Phase 2 results in in-place closure, the decommissioning waste volumes generated for the entire Phased Decisionmaking Alternative would be similar to the sum generated by adding the Phase 1 waste volumes to approximately 30 percent of the waste volumes generated under the Sitewide Close-In-Place Alternative.	Not applicable

Activity	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)*	*No Action Alternative*
Packaged Waste from Site Monitoring and Maintenance or Long-term Stewardship (cubic meters per year) [f]				
Nonhazardous	0	0	11	32
Hazardous	0	0	< 1	1
LLW	0	110	180	450
MLLW	0	0	0	< 1
Total [b]	0	110	190	480
Impacts	Not applicable	Annual waste volumes would be less than those that would be experienced under the No Action Alternative (continuing current activities) and therefore would have little impact on the waste management infrastructure.	Annual long-term waste generation rates for Phase 2 would be almost double the Phase 1 monitoring and maintenance rates if the remaining facilities are closed in place, and would be zero if Phase 2 results in the removal of the remaining underground structures and wastes. Annual waste volumes would be less than those that would be experienced under the No Action Alternative (continuing current activities) and therefore would have little impact on the waste management infrastructure.	Annual waste volumes would be similar to those currently experienced for these activities and therefore would have little impact on the waste management infrastructure.
Orphan Waste Management (cubic meters per year)				
LLW	3.2 [d]	< 3.2 [d]	_ 3.2 [d, e]	0
Impacts	Until the issues related to disposal of commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, and non-defense transuranic waste are resolved, these wastes would be stored in the Container Management Facility. High-level radioactive waste would be stored in the Interim Storage Facility until shipped to a geologic repository for disposal.	Until the issues related to disposal of commercial Class B and C low-level radioactive waste and non-defense transuranic waste are resolved, these wastes would be stored in Lag Storage Area 4. High-level radioactive waste would be stored in the Interim Storage Facility until shipped to a geologic repository for disposal.	Until the issues related to disposal of non-defense transuranic waste are resolved, this waste would be stored in Lag Storage Area 4. High-level radioactive waste would be stored in the Interim Storage Facility until shipped to a geologic repository for disposal.	High-level radioactive waste would continue to be stored in the Main Plant Process Building until shipped to a geologic repository for disposal.

LLW = low-level radioactive waste, GTCC = Greater-Than-Class C waste, TRU = transuranic waste, MLLW = mixed low-level radioactive waste.

[a] Pre-WVDP Class B and C low-level radioactive waste, Greater-Than-Class C low-level radioactive waste, and non-defense transuranic waste do not have a clear disposal path and may need to be stored on site until a disposal location is identified.

[b] Totals may not add due to rounding.

[c] Quantities indicated are the maximum quantities of packaged waste projected in the technical reports. Values are rounded to two significant figures.

[d] This annual volume is generated only if orphan waste is stored.

[e] Annual volumes are dependent on Phase 2 decisions, but would be less than or equal to those listed for the Sitewide Removal Alternative.

[f] Wastes from long-term stewardship would not be generated for the Sitewide Removal Alternative, but some waste would be annually generated as part of temporary operation of an orphan waste facility. Long-term stewardship wastes would be generated for the Sitewide Close-In-Place Alternative. Monitoring and maintenance waste would be generated as part of Phase 1 of the Phased Decisionmaking Alternative and the No Action Alternative. Wastes from long-term stewardship may be generated following completion of Phase 2 of the Phased Decisionmaking Alternative if the decision of Phase 2 is close-in-place.

Note: Quantities indicated are the maximum quantities of packaged waste projected in the technical reports. Values are rounded to two significant figures. To convert cubic meters to cubic feet, multiply by 35.314.

Source: Summarized from Tables 4–46 and 4–47 in this chapter.

Table 4–46 Comparison of Estimated Packaged Waste Volumes for Decommissioning Activities (cubic meters) [a]

Waste Type (Disposal Location)	*Sitewide Removal Alternative* [c]	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [c, d]	*No Action Alternative*
Assuming the DOE/Commercial Disposal Option				
Nonhazardous construction/demolition debris (commercial)	120,000	15,000	35,000	0
Hazardous (commercial)	18	3	2	0
Low-level radioactive				
DOE Low specific activity	300,000	5,300	150,000	0
DOE Class A equivalent	35,000	3,000	19,000	0
DOE Class B equivalent	140	6	100	0
DOE Class C equivalent	1,300	44	1,100	0
Low specific activity/Class A [e] (commercial)	1,200,000	1,500	25	0
Class B/C [f, g] (commercial)	4,900	23	0	0
Greater-Than-Class C [g] (uncertain)	4,200	0	0	0
Transuranic [g] (uncertain)	1,000	39	710	0
Mixed low-level radioactive [h] (commercial)	570	410	41	0
Total	1,600,000	26,000	210,000	0
Assuming the Commercial Disposal Option				
Nonhazardous construction/demolition debris (commercial)	120,000	15,000	35,000	0
Hazardous (commercial)	18	3	2	0
Low-level radioactive (commercial)				
Low specific activity (commercial)	1,400,000	6,000	150,000	0
Class A (commercial)	120,000	4,200	19,000	0
Class B (commercial)	2,600	6	110	0
Class C (commercial)	4,000	66	1,200	0
Greater-Than-Class C [g] (uncertain)	4,200	0	0	0
Transuranic [g] (uncertain)	1,000	39	710	0
Mixed low-level radioactive [h] (commercial)	570	410	41	0
Total	1,600,000	26,000	210,000	0

[a] Quantities indicated are the maximum quantities of packaged waste projected in the technical reports. Values are rounded to two significant figures. Totals may not add due to rounding.

[b] Represents the volumes of wastes to be managed from ongoing activities at WNYNSC, as described in Chapter 3, Table 3–20, of this EIS.

[c] If the waste incidental to reprocessing process is not applied to the empty high-level radioactive waste storage tanks and waste residuals in the tanks, for the Sitewide Removal Alternative approximately 500 cubic meters (18,000 cubic feet) of waste would be added to the inventory of high-level radioactive waste already stored on the site, and the amount of low-level radioactive waste and transuranic waste shown in this table would be reduced by about 210 cubic meters (7,500 cubic feet) and 280 cubic meters (10,000 cubic feet), respectively. For Phase 1 of the Phased Decisionmaking Alternative, approximately 51 cubic meters (1,800 cubic feet) of waste would be added to the inventory of high-level radioactive waste, and the amount of low-level radioactive waste and transuranic waste would be reduced by about 32 cubic meters (1,100 cubic feet) and 19 cubic meters (670 cubic feet), respectively.

[d] If Phase 2 of the Phased Decisionmaking Alternative results in removal of the remaining underground structures and wastes, the total decommissioning waste volumes generated for the entire Phased Decisionmaking Alternative (Phases 1 and 2) would be expected to be very similar to those generated under the Sitewide Removal Alternative. If Phase 2 of the Phased Decisionmaking Alternative results in in-place closure of much of the remaining underground structures and wastes, the decommissioning waste volumes generated for the entire Phased Decisionmaking Alternative (Phases 1 and 2) would be expected to be similar to the sum generated by adding the Phase 1 waste volumes to approximately 30 percent of the waste volumes generated under the Sitewide Close-In-Place Alternative (WVES 2008).

[e] Represents pre-WVDP low specific activity and Class A waste planned for disposal at a commercial disposal facility.

[f] Represents pre-WVDP Class B and C waste planned for disposal at a commercial disposal facility.

[g] Pre-WVDP Class B and C low-level radioactive waste, Greater-Than-Class C low-level radioactive waste, and non-defense transuranic waste do not have a clear disposal path and may need to be stored on site until a disposal location is identified.

[h] Represents mixed low-level radioactive waste planned for treatment and disposal at a commercial disposal facility.

Note: To convert cubic meters to cubic feet, multiply by 35.314.

Sources: WSMS 2008a, 2008b, 2008c, 2008d, 2008e.

Table 4–47 Comparison of Estimated Annual Packaged Waste Volumes for Site Monitoring and Maintenance or Long-term Stewardship Activities (cubic meters per year) [a]

Waste Type	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [b]	*No Action Alternative*
Disposal Using Commercial and DOE Facilities				
Nonhazardous construction/demolition debris	0	0	11	32
Hazardous	0	0	< 1	1
Low-level radioactive				
Low specific activity	0	100	110	110
Class A	3 [d]	9	70	340
Mixed low-level radioactive [c]	0	0	0	< 1
Total	3 [d]	110	190	480

[a] Wastes from long-term stewardship would not be generated for the Sitewide Removal Alternative, although wastes could be annually generated as part of temporary operation of an orphan waste storage facility. Long-term stewardship wastes would be generated for the Sitewide Close-In-Place Alternative. Site monitoring and maintenance wastes would be generated as part of Phase 1 of the Phased Decisionmaking Alternative and the No Action Alternative. Wastes from long-term stewardship may be generated following completion of Phase 2 of the Phased Decisionmaking Alternative if the decision for Phase 2 is close-in-place.

[b] Annual volumes are dependent on Phase 2 decisions. Annual long-term stewardship waste generation rates for Phase 2 would be almost double the Phase 1 rates if remaining facilities are closed in place, and would be zero if Phase 2 results in the removal of the remaining underground structures and wastes (WVES 2008).

[c] Represents mixed low-level radioactive waste planned for treatment and disposal at a commercial disposal facility.

[d] Generated as part of operation of a facility for optional temporary storage of orphan waste.

Note: Values are rounded to two significant figures. Totals may not add due to rounding. To convert cubic meters to cubic feet, multiply by 35.314.

Sources: WSMS 2008a, 2008b, 2008c, 2008d, 2008e.

Table 4–48 Waste Disposal Options

Waste Type	*Disposal Option(s)*
Nonhazardous construction/demolition debris	Permitted commercial construction/demolition debris landfill
Hazardous	Permitted commercial hazardous waste treatment and/or disposal facility
Low-level radioactive (low specific activity/ Class A/B/C)	Under the DOE/Commercial Disposal Option, DOE low-level radioactive waste would be disposed of at DOE facilities, while commercial low-level radioactive waste would be disposed of at commercial facilities. Under the Commercial Disposal Option, all low-level radioactive waste would be disposed of at commercial facilities.
Greater-Than-Class C	No disposal facility currently available [a]
Transuranic	No disposal facility currently identified for non-defense transuranic waste [b]
Mixed low-level radioactive	Permitted commercial mixed low-level radioactive waste disposal facility, such as EnergySolutions in Clive, Utah
High-level radioactive	Future Federal geologic repository, assumed to be Yucca Mountain, Nevada

[a] All Greater-Than-Class C waste generated as part of any EIS alternative would be safely stored until an appropriate offsite disposal facility is available. DOE proposes to identify a disposal facility for Greater-Than-Class C low-level radioactive and potential non-defense transuranic waste based on the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement* (DOE/EIS-0375) (72 FR 40135). As announced in the July 23, 2007, Notice of Intent, the GTCC EIS will evaluate several DOE sites and generic locations for the disposal of GTCC waste and similar DOE waste.

[b] All non-defense transuranic waste generated as part of any EIS alternative would be safely stored until DOE has determined that all statutory and regulatory requirements regarding offsite disposal have been met, subject to further NEPA review as appropriate.

Sources: Modified from WSMS 2008e.

Low-level radioactive waste (e.g., contaminated personal protective equipment, tools, filters, rubble, debris, soil, and sediment) would be generated during decommissioning and/or site monitoring and maintenance or long-term stewardship activities. Low-level radioactive waste would be packaged in Sealand containers, lift liners, 208-liter (55-gallons) drums, B-25 boxes, HICs, or similar containers, depending on the waste classification (WSMS 2008a, 2008e). Low-level radioactive waste is typically not treated, or only minimally treated (e.g., drying and compaction), before being sent directly to disposal. Therefore, long-term storage facilities would not be required for most low-level radioactive waste. Class B and C low-level radioactive waste may pose an exception as described later in this section.

In May 2000, the State of South Carolina passed an act forming the Atlantic Compact (which includes the States of South Carolina, New Jersey, and Connecticut), under the Low-Level Radioactive Waste Policy Act. As of June 2008, the Atlantic Compact does not accept waste for disposal at the Barnwell Disposal Facility. The Barnwell, South Carolina, facility was the only disposal facility recently available to West Valley for the disposal of Class B or C commercial wastes. Therefore, under alternatives that generate commercial Class B or C wastes, onsite storage would be needed until an offsite disposal location is available.

Wastes buried in the NDA and SDA that exceed the low-level radioactive waste Class C criteria of 10 CFR Part 61 are assumed to be Greater-Than-Class C wastes, which are generally not acceptable for near-surface disposal.[25] Only the Sitewide Removal Alternative (or the Phased Decisionmaking Alternative if Phase 2 decisions result in removal of remaining contaminants) has the potential to generate Greater-Than-Class C waste. Under the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240), the Federal Government is responsible for disposal of Greater-Than-Class C waste in a facility licensed by the NRC. However, no such Greater-Than-Class C disposal facility exists at this time. An *Environmental Impact Statement for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste (GTCC EIS)* (DOE/EIS-0375) that evaluates alternatives for developing a Greater-Than-Class C disposal facility is being prepared (72 FR 40135). Therefore, under the Sitewide Removal Alternative, onsite storage would be needed until an offsite disposal location is available.

The *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement (WIPP SEIS)* (DOE/EIS-0026-S-2) analyzed the receipt and disposal of 1,890 cubic meters (66,744 cubic feet) of transuranic waste from WVDP (DOE 1997b). The 1,000 cubic meters (35,000 cubic feet) of packaged transuranic waste under the maximum alternative (Sitewide Removal Alternative), when added to the 2,100 cubic meters (74,000 cubic feet) of transuranic waste being managed from ongoing activities at WNYNSC, would exceed the capacity analyzed for the WVDP in the *WIPP SEIS*. Under all alternatives, transuranic waste generated during decommissioning and/or site monitoring and maintenance or long-term stewardship would be safely stored on site until DOE has determined that all statutory and regulatory requirements regarding disposal have been met, subject to further NEPA review as appropriate.

Decommissioning and/or site monitoring and maintenance or long-term stewardship activities would also generate mixed Class A low-level radioactive waste (e.g., contaminated equipment, filters, sludge, soils, and sediment). Mixed low-level radioactive wastes generated during decommissioning would be sent to a commercial disposal facility such as EnergySolutions in Clive, Utah, for treatment and disposal. Mixed low-level radioactive waste would be treated to meet RCRA land disposal restriction treatment standards prior to disposal. This mixed low-level radioactive waste would be packaged and transported in a manner consistent with its chemical or radiological characteristics, as described in 49 CFR Part 173.

The existing high-level radioactive waste canisters would be stored on site until they could be transported off site for disposal at a geologic repository for high-level radioactive waste. The impacts of disposal at Yucca

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[25] Pursuant to 10 CFR 61.7, there may be some instances where Greater-Than-Class C waste would be acceptable for near-surface disposal; these instances would be evaluated on a case-by-case basis.

Mountain are analyzed in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Yucca Mountain EIS)* (DOE 2002b), and its Supplemental EIS (DOE 2008b).

No high-level radioactive waste would be generated by decommissioning and/or site monitoring and maintenance or long-term stewardship of the WNYNSC, except in the situation where the waste incidental to reprocessing process outlined in DOE Manual 435.1-1 (DOE 1999a) is not applied in classifying remedial waste as low-level radioactive waste and transuranic waste. Therefore, two waste disposal options (waste incidental to reprocessing and high-level radioactive waste) were evaluated for the high-level radioactive waste tanks in WMA 3. The waste incidental to reprocessing option assumes the waste associated with Tanks 8D-1, 8D-2, and 8D-4 would be managed as low-level radioactive waste and transuranic waste. However, future characterization may require some of this waste to be managed as mixed low-level radioactive waste. The quantities of waste associated with this approach are included in Table 4–46. If it is determined that the waste incidental to reprocessing process cannot be applied (i.e., the wastes associated with these tanks cannot be managed as low-level radioactive waste and transuranic waste), the high-level radioactive waste option assumes Tanks 8D-1, 8D-2, and 8D-4 would need to be managed as high-level radioactive waste, and Tank 8D-3 as low-level radioactive waste.

If the high-level radioactive waste option becomes necessary, a maximum of approximately 500 cubic meters (18,000 cubic feet) of high-level radioactive waste would be added to the inventory of high-level radioactive waste already stored on site, and the amount of low-level radioactive waste and transuranic waste shown in Table 4–46 for the Sitewide Removal Alternative would be reduced by about 210 cubic meters (7,500 cubic feet) and 280 cubic meters (10,000 cubic feet), respectively.

Under the alternatives analyzed in this EIS, varying amounts of waste would be processed and shipped off site for disposal. For example, under the Sitewide Removal Alternative, all waste would be processed and shipped off site for disposal. Under the other alternatives, lesser quantities of waste would be processed and disposed of off site, meaning that more of the waste would remain on site.

There are uncertainties surrounding the options available for offsite disposal of commercial Class B and C low-level radioactive waste, transuranic waste, and Greater-Than-Class C waste generated under these alternatives. Because of these uncertainties, both offsite disposal and onsite storage of these wastes were analyzed. If onsite storage is needed, it would be accomplished using the new Container Management Facility or existing Lag Storage Area 4.

4.1.11.3 Impacts of the Alternatives

This section describes the waste management impacts specific to each EIS alternative.

Table 4–49 shows the new waste management facilities that would be constructed under each of the alternatives. Upon completion of the actions to be taken in these facilities, they would be demolished and disposed of off site. For additional information on the actions that would be taking place in these facilities, refer to Appendix C of this EIS and the appropriate technical report (WSMS 2008a, 2008b, 2008c, 2008d).

Table 4–49 New Waste Management Facilities Associated with West Valley Demonstration Project Alternatives

Waste Management Facility	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [a]	*No Action Alternative*
Interim Storage Facility for high-level radioactive waste canisters	X	X	X	
Waste Tank Farm Waste Processing Facility	X			
Soil Drying Facility	X			
Leachate Treatment Facility	X	X		
Container Management Facility	X			

[a] Additional actions, including the construction of additional waste management facilities, could be taken in the future under Phase 2 of the Phased Decisionmaking Alternative.
Sources: WSMS 2008a, 2008b, 2008c, 2008d.

Sitewide Removal Alternative

As shown in Tables 4–45 through 4–47, the Sitewide Removal Alternative would generate the largest volume of waste (approximately 1.6 million cubic meters [56 million cubic feet]) from decommissioning, but zero waste from long-term stewardship. Nonhazardous waste, Class A low-level radioactive waste (including low specific activity waste), and Greater-Than-Class C waste would exceed the volumes being managed from ongoing activities at WNYNSC. Nonhazardous waste is common demolition debris that would be expected to have no adverse impact on the capacity of commercial disposal facilities. Much of the Class A low-level radioactive waste is low specific activity waste that would be expected to have no adverse impact on the capacity of DOE or commercial disposal facilities. Until the issues related to disposal of commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, and WNYNSC-generated transuranic waste are resolved, these wastes would be safely stored in the new Container Management Facility. An additional 3.2 cubic meters (110 cubic feet) of Class A low-level radioactive waste would be generated annually during maintenance and surveillance of this orphan waste. High-level radioactive waste would be safely stored in the new Interim Storage Facility until shipped to a geologic repository for disposal.

New waste management facilities that would be constructed to support decommissioning of the site would include:

- An Interim Storage Facility for high-level radioactive waste canisters (see Appendix C, Section C.4.1, of this EIS),
- A Waste Tank Farm Waste Processing Facility to support exhumation of the high-level radioactive waste tanks (see Appendix C, Section C.4.2, of this EIS),
- A Soil Drying Facility to process soils contaminated by the North Plateau Groundwater Plume (see Appendix C, Section C.4.3, of this EIS),
- A Leachate Treatment Facility to process contaminated water from the NDA and SDA (see Appendix C, Section C.4.5, of this EIS), and
- A Container Management Facility to process wastes exhumed from the NDA and SDA and to store orphan waste (see Appendix C, Section C.4.4, of this EIS).

Upon completion of the actions to be taken in these facilities, the facilities would be demolished and disposed of off site. The waste volumes reported for this alternative reflect demolition of these facilities. Additional information on the activities that would take place in these facilities is presented in Appendix C of this EIS and the Sitewide Removal Alternative technical report (WSMS 2008a).

Sitewide Close-In-Place Alternative

As shown in Tables 4–45 through 4–47, the Sitewide Close-In-Place Alternative would generate the third largest volume of waste (approximately 26,000 cubic meters [920,000 cubic feet]) from decommissioning, and approximately 110 cubic meters (3,900 cubic feet) per year from long-term stewardship activities. All waste volumes would be less than the volumes being managed from ongoing activities at WNYNSC, and therefore should have minimal impacts on the waste management infrastructure. Until the issues related to disposal of commercial Class B and C low-level radioactive waste and WNYNSC-generated transuranic waste are resolved, these wastes would be safely stored in Lag Storage Area 4. Less than 3.2 cubic meters (110 cubic feet) of Class A low-level radioactive waste would be generated annually during maintenance and surveillance of this orphan waste. High-level radioactive waste would be safely stored in the Interim Storage Facility until shipped to a geologic repository for disposal.

Under the Sitewide Close-In-Place Alternative, the high-level radioactive waste tanks and vaults, below-grade portions of the Main Plant Process Building, NDA, SDA, Construction and Demolition Debris Landfill, and Scrap Material Landfill would be stabilized and closed in place. New waste management facilities that would be constructed to support closure and decommissioning of the site would include:

- An Interim Storage Facility for high-level radioactive waste canisters (see Appendix C, Section C.4.1, of this EIS), and

- A Leachate Treatment Facility to process contaminated water from the NDA and SDA (see Appendix C, Section C.4.5, of this EIS).

Upon completion of the actions to be taken at the Interim Storage Facility and Leachate Treatment Facility, these facilities would be demolished and disposed of off site. The waste volumes reported for this alternative reflect demolition of these facilities. Additional information on the activities that would be taking place in these facilities is presented in Appendix C of this EIS and the Sitewide Close-In-Place Alternative technical report (WSMS 2008b).

Phased Decisionmaking Alternative

As shown in Tables 4–45 through 4–47, Phase 1 of the Phased Decisionmaking Alternative would generate the second largest volume of waste (approximately 210,000 cubic meters [7.5 million cubic feet]) from decommissioning, and approximately 190 cubic meters (6,800 cubic feet) per year from site monitoring and maintenance activities. Nonhazardous waste and Class A low-level radioactive waste (including low specific activity waste) would exceed the volumes being managed from ongoing activities at WNYNSC. The nonhazardous waste is common demolition debris that would be expected to have no adverse impact on commercial disposal facilities. Much of the Class A or DOE-equivalent low-level radioactive waste is low specific activity waste that would be expected to have no adverse impact on DOE or commercial disposal facilities. Until the issues related to disposal of WNYNSC-generated transuranic waste are resolved, these wastes would be safely stored in Lag Storage Area 4. Less than or equal to 3.2 cubic meters (110 cubic feet) of Class A low-level radioactive waste would be generated annually during maintenance and surveillance of this orphan waste. High-level radioactive waste would be safely stored in the new Interim Storage Facility until shipped to a geologic repository for disposal.

New waste management facilities constructed to support decommissioning of the site would include an Interim Storage Facility for high-level radioactive waste canisters (see Appendix C, Section C.4.1, of this EIS). Upon completion of the actions to be taken at the Interim Storage Facility, it would be demolished and disposed of off site. The waste volumes reported for this alternative reflect demolition of this facility. Additional information on the activities that would take place in this facility is presented in Appendix C of this EIS and the Phased Decisionmaking Alternative technical report (WSMS 2008c).

Under the Phased Decisionmaking Alternative, Phase 2 decisions would be deferred until additional studies are completed. These later decisions may result in the removal of additional facilities and waste, or the closure of some facilities in place. If Phase 2 decisions result in removal of the remaining underground structures and wastes, the total decommissioning waste volumes generated for the entire Phased Decisionmaking Alternative (Phases 1 and 2) would be very similar to those generated under the Sitewide Removal Alternative (see Table 4–46). If Phase 2 decisions result in in-place closure of much of the remaining underground structures and wastes, the decommissioning waste volumes generated for the entire Phased Decisionmaking Alternative (Phases 1 and 2) would be expected to be similar to the sum generated by adding the Phase 1 waste volumes to approximately 30 percent of the waste volumes generated under the Sitewide Close-In-Place Alternative (see Table 4–46). Annual long-term stewardship waste generation rates for Phase 2 would be almost double the Phase 1 rates if remaining facilities are closed in place (WVES 2008), and would be zero if Phase 2 results in the removal of the remaining underground structures and wastes.

No Action Alternative

As shown in Tables 4–45 through 4–47, the No Action Alternative would generate no waste from decommissioning, and the largest volume of waste (approximately 480 cubic meters [17,000 cubic feet] per year) from site monitoring and maintenance activities. All waste volumes would be less than the volumes being managed from ongoing activities at WNYNSC, and therefore should have minimal impacts on the waste management infrastructure. High-level radioactive waste canisters would continue to be safely stored in the Main Plant Process Building until shipped to a geologic repository for disposal.

Under the No Action Alternative, no new waste management facilities would be constructed. Additional information on the activities that would take place under this alternative is presented in Appendix C of this EIS and the No Action Alternative technical report (WSMS 2008d).

4.1.12 Transportation

Both radiological and nonradiological impacts would result from the shipment of radioactive materials from WNYNSC to offsite disposal sites. Radiological impacts are those associated with the effects from low levels of radiation emitted during incident-free transportation and from the accidental release of radioactive materials, and are expressed as additional LCFs. Nonradiological impacts are independent of the nature of the cargo being transported, and are expressed as fatal traffic accidents when there is no release of radioactive material. Incident-free nonradiological impacts, such as increases in traffic density, are discussed in Section 4.1.2, Site Infrastructure, of this chapter, while exposure to nonradiological pollutants from traffic emissions is discussed in Section 4.1.5, Air Quality and Noise, of this chapter.

A summary of the transportation impacts of each alternative is presented in **Table 4–50**.

Table 4–50 Summary of Transportation Impacts

Environmental Resource	***Sitewide Removal Alternative (64 years)***	***Sitewide Close-In-Place Alternative (7 years)***	***Phased Decisionmaking Alternative***	***No Action Alternative***
Incident-Free Radiological Impacts	Largest number of truck or rail shipments of radioactive waste and highest public dose. However, it is unlikely that transportation of radioactive waste would cause an additional LCF as a result of radiation.	Third largest number of truck or rail shipments of radioactive waste and public dose. It is unlikely that transportation of radioactive waste would cause an additional LCF as a result of radiation.	Second largest number of truck or rail shipments of radioactive waste and public dose from Phase 1 actions. It is unlikely that transportation of radioactive waste would cause an additional LCF as a result of radiation. If removal of remaining contamination were selected for Phase 2, impacts for both phases of this alternative would be equal to those of the Sitewide Removal Alternative; if in-place closure were selected, impacts for both phases would be greater than those for the Sitewide Close-In-Place Alternative because of the removal actions completed in Phase 1.	Smallest number of truck or rail shipments of radioactive waste and public dose. It is unlikely that transportation of radioactive waste would cause an additional LCF as a result of radiation.
Radiological Impacts from Accidents	Maximum radiological dose-risk to general population estimated to be 1.8 person-rem, or 0.0011 LCFs.	Maximum radiological dose-risk to general population estimated to be 0.030 person-rem, or 0.000018 LCFs.	Maximum radiological dose-risk to general population estimated to be 0.38 person-rem, or 0.00023 LCFs. If removal of remaining contamination were selected for Phase 2, impacts for both phases of this alternative would be equal to those of the Sitewide Removal Alternative; if in-place closure were selected, impacts for both phases would be greater than those for the Sitewide Close-In-Place Alternative because of the removal actions completed in Phase 1.	Maximum radiological dose-risk to general population estimated to be 0.00067 person-rem, or 4.0×10^{-7} LCFs.
Nonradiological Impacts-Traffic Fatalities	Up to 30 fatalities for radioactive waste shipments (rail) and up to 1 fatality for nonradioactive shipments over the duration of decommissioning.	No fatalities for radioactive waste shipments and up to 1 fatality for nonradioactive shipments over the duration of decommissioning.	Up to 4 fatalities for radioactive waste shipments (rail) and no fatalities for nonradioactive shipments over the duration of Phase 1 of decommissioning. If removal of remaining contamination were selected for Phase 2, impacts for both phases of this alternative would be equal to those for the Sitewide Removal Alternative; if in-place closure were selected, impacts for both phases would be greater than those for the Sitewide Close-In-Place Alternative because of the removal actions completed in Phase 1.	No fatalities for radioactive waste shipments (rail) and no fatalities for nonradioactive shipments over a 25-year period.

LCF = latent cancer fatality.

4.1.12.1 Methodology and Assumptions

Shipping packages containing radioactive materials emit low levels of radiation; the amount of radiation depends on the kind and amount of transported materials. DOT regulations require that shipping packages containing radioactive materials have sufficient radiation shielding to limit the radiation to 10 millirem per hour at a distance of 2 meters (6.6 feet) from the transporter. For incident-free transportation, the potential human health impacts from the radiation field surrounding the transportation packages were estimated for transportation workers and the general population along the route (off traffic, or off-link), as well as people sharing the route (in traffic or on-link), at rest areas, and at other stops along the route. The RADTRAN 5 computer program (Neuhauser and Kanipe 2003) was used to estimate the impacts for transportation workers and populations, as well as the impacts to an MEI (a person stuck in traffic, a gas station attendant, an inspector, etc.) who could be a worker or a member of the public.

Transportation accidents involving radioactive materials present both nonradiological and radiological risks to workers and the public. Nonradiological impacts of transportation accidents include traffic accident fatalities. Radioactive material would be released during transportation accidents only when the package carrying the material is subjected to forces that exceed the package design standard. Only a severe fire and/or a powerful collision, of extremely low probability, could lead to a transportation package of the type used to transport radioactive material being damaged to the extent that there could be a release of radioactivity to the environment with significant consequences.

The impact of a specific radiological accident is expressed in terms of probabilistic risk (i.e., dose-risk), which is defined as the accident probability (i.e., accident frequency) multiplied by the accident consequences (dose). The overall risk is obtained by summing the individual risks from all reasonably conceivable accidents. The analysis of accident risks takes into account a spectrum of accident severities ranging from high-probability accidents of low severity (e.g., fender bender) to hypothetical high-severity accidents that have a low probability of occurrence. In addition to calculating the radiological risks that would result from all reasonably conceivable accidents during transportation of radioactive wastes, this EIS assesses the highest consequences of a maximum reasonably foreseeable accident with a radioactive release frequency greater than 1×10^{-7} (1 chance in 10 million) per year in an urban or suburban population area along the route. The latter consequences were determined for atmospheric conditions that could prevail during accidents. This analysis used the RISKIND computer program to estimate doses to individuals and populations (Yuan et al. 1995).

Incident-free radiological health impacts are expressed in terms of additional LCFs. Radiological accident health impacts are also expressed as additional LCFs, and nonradiological accident risk as additional immediate (traffic) fatalities. LCFs associated with radiological exposure were estimated by multiplying the occupational (worker) and public dose by a dose conversion factor of 0.0006 LCFs per person-rem of exposure (DOE 2002a). The health impacts associated with the shipment of radioactive wastes were calculated assuming that all wastes would be transported using either truck or rail transport.

In determining transportation risks, per-shipment risk factors were calculated for incident-free and accident conditions using the RADTRAN 5 computer program (Neuhauser and Kanipe 2003) in conjunction with the Transportation Routing Analysis Geographic Information System (TRAGIS) computer program (Johnson and Michelhaugh 2003) to choose transportation routes in accordance with DOT regulations. The TRAGIS program provides population density estimates along the routes based on the 2000 census for determining population radiological risk factors. For incident-free operations, the affected population includes individuals living within 800 meters (0.5 mile) of each side of the road or rail line. For accident conditions, the affected population includes individuals living within 80 kilometers (50 miles) of the accident, and the MEI is assumed to be an individual located 100 meters (330 feet) directly downwind from the accident. Additional details on the analysis approach and on modeling and parameter selections are provided in Appendix J of this EIS.

The EIS evaluated two disposal options for disposing of the low-level radioactive waste generated during WNYNSC decommissioning:

- *DOE/Commercial Disposal Option* – DOE low-level radioactive waste would be disposed of at DOE disposal facilities. Commercial low-level radioactive waste would be disposed of at commercial disposal facilities.

- *Commercial Disposal Option* – All low-level radioactive waste would be disposed of at commercial disposal facilities.

For both options, all waste would be disposed of in accordance with current waste acceptance criteria and appropriate permits/licenses. Transportation impacts for each of these options were estimated with the following assumptions:

- Construction debris and hazardous wastes would be transported to local commercial disposal sites estimated to be located about 160 kilometers (100 miles) from the site.

- Radioactive Class A and low specific activity low-level radioactive wastes (or DOE-equivalent wastes) would be transported to NTS (DOE/Commercial Disposal Option) or to a commercial disposal facility such as EnergySolutions in Utah (Commercial Disposal Option).

- Class B and C low-level radioactive wastes (or DOE-equivalent wastes) would be transported either to NTS (DOE/Commercial Disposal Option) or a commercial disposal site (Commercial Disposal Option). For analysis purposes, because of the expectation that Barnwell would not accept WVDP waste after 2008 (see Section 4.1.11, Waste Management, of this chapter), Class B and C wastes were assumed to be transported to a hypothetical disposal facility having route characteristics similar to those for the commercial Hanford Site in Washington State.[26]

- Mixed low-level radioactive wastes, after treatment, would be transported for either option to a commercial disposal facility such as EnergySolutions in Utah.

- The impacts of transporting WVDP transuranic waste to WIPP were included for purposes of analysis, although DOE is not currently approved to ship WVDP transuranic waste to WIPP, and there is currently no identified disposal facility for non-defense transuranic waste.[27]

- To make comparisons of impacts among the alternatives, this transportation analysis uses the potential future Yucca Mountain Geological Repository in Nevada as a representative site for disposal of Greater-Than-Class C waste.[27] There is currently no disposal facility for Greater-Than-Class C waste; the *GTCC EIS*, in preparation, evaluates alternatives for developing a Greater-Than-Class C disposal facility.

Waste materials to be shipped off site for disposal were classified into three broad disposal groupings: construction and demolition debris, hazardous wastes, and radioactive wastes. Low-level radioactive wastes were classified in accordance with Federal regulations governing land disposal of radioactive waste (10 CFR Part 61), and for transportation of low-specific activity waste. The volumes of the different waste

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[26] *DOE also analyzed the impacts associated with transporting commercial Class B and C low-level radioactive waste to the Barnwell Disposal Facility in South Carolina. See Appendix J, Table J–8.*

[27] *A disposal facility for Greater-Than-Class C low-level radioactive waste and potential non-defense transuranic waste would be determined through the Record of Decision for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (DOE/EIS-0375). As announced in the July 23, 2002, Notice of Intent, the GTCC EIS will evaluate several DOE sites and generic locations for the disposal of Greater-Than-Class C waste and similar DOE wastes.*

types that are expected to be generated under each alternative during WNYNSC decommissioning are given in Section 4.1.11, Waste Management, of this chapter.

4.1.12.2 Summary of Expected Transportation Impacts

Table 4–51 provides the estimated number of waste shipments by truck under each alternative by waste type. A shipment is defined as the amount of waste transported on a single truck or a single railcar. For each waste type, each railcar would contain twice the amount of waste transported by a single truck. Multiple railcars (e.g., 3 to 4 railcars) could be used to reduce the number of rail shipments. However, because the rail accident and fatalities data are calculated per railcar-kilometer, the transportation analysis presented here is based on one railcar per rail shipment. While it may be possible to reduce the number of rail shipments by using multiple railcars, there would be a proportional increase in the transportation risks per transport in terms of the radioactive waste present, accident frequency, and nonradiological transport accident fatalities. There are other options that may be considered, including shipments of waste using a combination of rail and trucks for disposal.[28] This EIS did not calculate all potential options. The results presented using either all truck shipments or all rail shipments would provide a range of risks that would encompass all potential options.

Table 4–52 summarizes the transportation impacts by disposal option for each alternative. The accident impacts presented in this table are those that would result from all reasonably conceivable impacts during transport of radioactive wastes. Impacts from accidents having the highest consequences of a maximally foreseeable accident are presented in Appendix J, Table J–11.

DOE and NYSERDA could choose to use a combination of rail and truck transport during the execution of any of the decommissioning alternatives. If that turns out to be the case, the dose to the general population would be expected to be between the lowest expected dose of about 2.8 person-rem, which is associated with all train transport to commercial disposal sites under the Sitewide Close-In-Place Alternative, and the highest expected dose of about 376 person-rem associated with truck transport to NTS under the Sitewide Removal Alternative. The additional LCFs that would be expected from such exposures to the general population range from 0.0017 to 0.23 LCF, thus, it is expected that there would be no additional LCFs to the population under any of the alternatives. Similarly, the lowest expected dose to the crew would be under the Sitewide Close-In-Place Alternative using rail transport (1.5 person-rem), while the highest dose would be for the Sitewide Removal Alternative using truck transport (2,220 person-rem) for disposal of all low-level radioactive waste at commercial sites. The additional LCFs that would be expected from exposures to the transportation crews would range from 0.0009 to 1.33; however, it should be noted that the maximum annual dose to a transportation worker would be 100 millirem per year, unless the individual is a trained radiation worker, for which doses would be administratively limited to an annual dose of 2 rem (DOE 1999b). The potential for a trained radiation worker to develop a fatal latent cancer from the maximum annual exposure of 2 rem is 0.0012 LCF. Therefore, an individual transportation worker would not be expected to develop a lifetime latent fatal cancer from exposures during these activities. The rail nonradiological accident fatality estimates presented in the table are based on the conservative assumption of one rail car of waste per train. The use of trains with higher numbers of waste rail cars would result in lower accident fatality estimates. In addition, there is no scenario where a combination of train and truck transport would be expected to result in a higher dose to the general population or the transportation crews than the truck-only options.

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[28] Shipments involving a combination of rail and truck for a specific shipment would involve workers who would transfer waste containers from railcars to trucks (or visa versa) at an intermodal station. Based on a study of total risk to workers and population from truck-only transportation and a combination of truck-rail transportation (PNNL 1999), it is estimated that the total dose to workers and public for a combination of rail and truck shipment would be less than those that could occur if the entire transportation occurred by truck.

Table 4–51 Estimated Number of Truck Shipments Under Each Alternative

DOE/Commercial Disposal Option					
Waste Types	***Assumed Disposal Location***	***Removal Alternative***	***Close-In-Place Alternative***	***Phased Decisionmaking Alternative***	***No Action Alternative*** [i]
LSA	NTS/EnergySolutions [j]	93,270	839	10,526	155
Class A [a]	NTS/EnergySolutions [j]	8,382	299	1,472	581
Class A [b]	NTS/EnergySolutions [j]	49	5	28	2
Class B and C [c]	NTS/Commercial [j]	924	0	79	0
Class C-RH [d]	NTS/Commercial [j]	125	35	22	0
Mixed LLW	Energy Solutions	40	28	3	1
GTCC [e]	Yucca	2,357	0	0	0
Transuranic [f]	WIPP	479	19	337	0
Hazardous [g]	Local	3	1	1	3
Other [h]	Local	7,801	1,014	2,315	53
Commercial Disposal Option					
Waste Types	***Assumed Disposal Location***	***Removal Alternative***	***Close-In-Place Alternative***	***Phased Decisionmaking Alternative***	***No Action Alternative*** [i]
LSA	EnergySolutions	93,270	839	10,526	155
Class A [a]	EnergySolutions	8,382	299	1,472	581
Class A [b]	EnergySolutions	49	5	28	2
Class B and C [c]	Commercial	1,075	0	221	0
Class C-RH [d]	Commercial	125	35	22	0
Mixed LLW	EnergySolutions	40	28	3	1
GTCC [e]	Yucca	2,357	0	0	0
Transuranic [f]	WIPP	479	19	337	0
Hazardous [g]	Local	3	1	1	3
Other [h]	Local	7,801	1,014	2,315	53

LLW = low-level radioactive waste, LSA = low specific activity waste, RH = remote-handled, GTCC = Greater-Than-Class C waste, NTS = Nevada Test Site, WIPP = Waste Isolation Pilot Plant.

[a] Class A low-level radioactive waste transported in Type A B-25 boxes.

[b] Class A low-level radioactive waste transported in 208-liter (55-gallon) drums.

[c] Class B and Class C contact-handled wastes are packaged in either high-integrity containers for transport to a Western United States site (for purposes of analysis only), or Type A B-25 boxes for transport to NTS. In accordance with the settlement agreement between DOE and the State of Washington of January 6, 2006, regarding the case *Washington v. Bodman*, DOE will not ship low-level and mixed low-level radioactive waste from WVDP to DOE's Hanford disposal facility until DOE has satisfied the requirements of the settlement agreement.

[d] Class C remote-handled wastes packaged in drums or high-integrity containers and transported in Type B casks. Class B wastes packaged in drums are also transported in Type B casks.

[e] For purposes of analysis only, it was assumed that GTCC waste would be shipped to the Yucca Mountain Geologic Repository. Several DOE sites and generic commercial locations are being evaluated in the GTCC EIS as potential disposal locations.

[f] For purposes of analysis only, it was assumed that transuranic waste would be shipped to WIPP.

[g] Hazardous waste would be disposed of at landfills within 160 kilometers (100 miles) of the site.

[h] This includes construction/demolition debris or other wastes that go to local landfills within about 160 kilometers (100 miles) of the site.

[i] Under the No Action Alternative, waste is generated both annually and periodically (every 25 years). Here, for the purposes of comparisons to other alternatives, waste shipments are given for monitoring and maintenance activities over a 25-year period.

[j] DOE waste would go to the Nevada Test Site or EnergySolutions or other appropriate commercial facility. Commercial waste would only go to EnergySolutions or other appropriate commercial facility because commercial wastes cannot be disposed of at DOE facilities.

Note: The values given in this table are for truck shipments. Rail shipments are assumed to be one-half of the number of truck shipments.

Table 4–52 Risks of Transporting Radioactive Waste Under Each Alternative [a]

LLW Disposal Option	Transport Mode	Number of Shipments	One-way Kilometers Traveled (million)	Incident-Free: Crew Dose (person-rem)	Incident-Free: Crew Risk [b]	Incident-Free: Population Dose (person-rem)	Incident-Free: Population Risk [b]	Accident: Radiological Risk [b]	Accident: Non-radiological Risk [b]
Sitewide Removal Alternative									
DOE/ Commercial	Truck	105,626	362.9	2,098.9	1.26	375.6	0.225	0.00086	7.54
	Rail	52,817	190.4	65.3	0.039	95.5	0.057	0.00074	29.78
Commercial	Truck	105,777	348.1	2,219.7	1.33	357.3	0.21	0.0011	7.2
	Rail	52,891	182.4	65.1	0.039	95.5	0.057	0.00094	28.5
Sitewide Close-In-Place Alternative									
DOE/ Commercial	Truck	1,225	4.4	50.6	0.030	11.5	0.0069	4.4×10^{-7}	0.09
	Rail	615	2.3	1.97	0.0012	2.9	0.0018	3.8×10^{-7}	0.37
Commercial	Truck	1,225	4.0	47.6	0.029	10.4	0.0062	4.0×10^{-7}	0.08
	Rail	615	2.1	1.5	0.0009	2.8	0.0017	3.8×10^{-7}	0.33
Phased Decisionmaking Alternative (Phase 1)									
DOE/ Commercial	Truck	12,467	48.8	273.7	0.16	71.4	0.043	0.000013	1.0
	Rail	6,237	25.7	10.6	0.0063	16.3	0.0098	8.4×10^{-6}	4.0
Commercial	Truck	12,609	41.4	402.7	0.24	58.9	0.035	0.00022	0.9
	Rail	6,306	21.6	11.0	0.0066	16.2	0.0097	0.00019	3.4
No Action Alternative [c]									
DOE/ Commercial	Truck	739	2.9	46.9	0.028	14.7	0.0088	4.3×10^{-7}	0.06
	Rail	371	1.5	2.0	0.00119	3.2	0.0019	3.1×10^{-7}	0.2
Commercial	Truck	739	2.4	38.9	0.023	12.1	0.0073	3.6×10^{-7}	0.05
	Rail	370	1.3	1.7	0.001	3.2	0.0019	3.0×10^{-7}	0.2

LCF = latent cancer fatality; LLW = low-level radioactivity waste, NTS = Nevada Test Site.

[a] For purposes of analysis only, Greater-Than-Class C and transuranic wastes are assumed to be transported to Yucca Mountain and WIPP, respectively. A disposal facility for Greater-Than-Class C low-level radioactive waste and potential non-defense transuranic waste will be determined through the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement* (DOE/EIS-0375) (72 FR 40135).

[b] Risk is expressed in terms of LCFs, except for nonradiological risk where it refers to the number of traffic accident fatalities.

[c] Under the No Action Alternative, for the purposes of comparisons to other alternatives, transportation impacts are provided for monitoring and maintenance activities over a 25-year period.

Note: To convert kilometers to miles, multiply by 0.62137.

4.1.12.3 Sitewide Removal Alternative

Under this alternative, DOE and NYSERDA would transport about 1.6 million cubic meters (2.1 million cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal at offsite locations over approximately 60 years. As indicated in Table 4–52, a very large number of shipments (105,780 truck shipments) of radioactive waste would be made under this alternative. Under the Commercial Disposal Option, all Class-C-or-lower low-level radioactive waste would be shipped to commercial disposal facilities. Under the DOE/Commercial Disposal Option, the Class-C-or-lower low-level radioactive waste for which New York State is responsible would still be transported to commercial disposal facilities. For purposes of analysis only, shipments of transuranic waste to WIPP and Greater-Than-Class C waste to Yucca Mountain are included under both disposal options. If rail transport were used, the total number of shipments would be about one-half of those made under truck transport (about 52,890 shipments). The total projected one-way distance traveled on public roads or rail lines transporting radioactive waste to the various disposal locations under this alternative would range from 348 to 363 million kilometers (217.5 to 226.8 million miles) for trucks, and from 182 to 190 million kilometers (114 to 118.9 million miles) for trains.

Impacts of Incident-Free Transportation

Under this alternative, the highest level of health impacts to transportation workers (e.g., truck crew) would occur under the Commercial Disposal Option, and impacts to the general population would occur under the DOE/Commercial Disposal Option using all truck shipments (see Table 4–52). Truck shipments result in higher crew doses. The impacts are proportional to the distance traveled and the assumed western commercial site (Hanford characteristics) is the farthest distance from WNYNSC and would be the major contributor to crew doses. In addition, for the general population, the shipments to NTS expose a larger number of public along the transportation routes.

Crew—The expected doses to crew members during the transportation of waste by truck would range from 2,099 to 2,220 person-rem, resulting in 1 (1.26 to 1.33) additional LCFs. However, it should be noted that maximum annual dose to a transportation worker would be 100 millirem per year, unless the individual is a trained radiation worker, who would be subject to administrative procedures that would limit the annual dose to 2 rem (DOE 1999b). The potential for a trained radiation worker to develop a fatal latent cancer from the maximum annual exposure is 0.0012 LCF. Therefore, an individual transportation worker would not be expected to develop a lifetime latent fatal cancer from exposure during these activities. If train transport were used, the expected doses to crew members during the transportation of waste under this alternative would be about 65 person-rem, resulting in less than 1 (0.039) additional LCF. Rail transport would expose the crew to much lower doses, due to the greater shielding and distance between the crew and the waste being transported, and the smaller number of shipments required.

Public—The expected cumulative dose to the general population during the transportation of waste by truck would range from 357 to 376 person-rem, resulting in less than 1 (0.21 to 0.23) additional LCFs. If train transport were used, the expected doses to the general population would be about 96 person-rem, resulting in less than 1 (0.057) additional LCF. Rail transport would lead to lower doses to the general population, due to the smaller number of shipments and lower exposure to people in the vicinity of stations where the reclassification and inspections would take place. Almost half of the doses to the general population from truck transport are from doses at rest areas, gas stations, and stops along the route.

If a combination of rail and truck transport were used during the execution of this alternative, the dose to the general population would be expected to be between the lowest expected dose of 96 person-rem associated with train transport and the highest expected dose of 376 person-rem associated with all truck transport. There is no scenario where a combination of train and truck transport would be expected to result in a higher dose to the general population than the truck option.

Impacts of Accidents During Transportation

As described previously, two sets of analyses were performed for the evaluation of radiological transportation accident impacts: impacts of maximum reasonably foreseeable accidents (accidents with radioactive release probabilities greater than 1×10^{-7} [1 chance in 10 million] per year), and impacts of all conceivable accidents (total transportation accidents).

For waste shipped under the Sitewide Removal Alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve contact-handled Class B/C waste in an HIC with no shielded cask (see Appendix J, Table J–11). These waste shipments are expected to occur over about 44 years (the number of years when Class B/C wastes would be generated). The probabilities of a truck or rail accident involving this type of waste shipment are slightly different. Transportation accident probabilities were calculated for all route segments (i.e., rural, suburban, and urban), and maximum consequences were determined for those route segments with a likelihood of release frequency exceeding 1-in-10 million per year. The maximum reasonably foreseeable probability of a truck accident involving this waste type would be 8.4×10^{-7} per year in a suburban area, while the maximum probability for a rail accident would be 5.8×10^{-7} per year in an urban area, or approximately 1 chance in a million each year for both truck and rail. The consequences for the truck and rail transport accident in terms of population dose would be 74.1 and about 1,190 person-rem, respectively. Such an exposure could result in less than 1 (0.04 to 0.7) excess LCF among the exposed population. The large difference in the general population doses between truck and rail accidents is due to the possibility of the rail accident occurring in an urban area with twice the waste inventory of the truck, while the truck accident is more likely to occur in a suburban area with one-eighth the population density of an urban area. Trains travel longer distances in urban areas than trucks, which tend to avoid such areas to the maximum extent possible. The maximum dose from a rail accident to an MEI, located at a distance of 100 meters (330 feet) and exposed to the accident plume for 2 hours, would be 0.30 rem, with a risk of 0.00018 LCF.

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose risk to the general population of 1.83 person-rem over the life of expected shipments, resulting in less than 1 (0.0011) LCF for truck transport under the Commercial Disposal Option, and a maximum nonradiological accident risk of 30 fatalities for rail transport under the DOE/Commercial Disposal Option (see Table 4–52).

Impacts of Construction and Operational Material and Hazardous Waste Transport

The impacts of transporting construction/demolition debris, materials for construction and erosion control (i.e., concrete, gravel/sand/soil, asphalt, steel, piping, fabric, etc.), and hazardous wastes were also evaluated. The estimated transportation impacts under this alternative would be 75.98 million kilometers (42.22 million miles) traveled, 26 (26.21) traffic accidents, and up to 1 (0.94) traffic accident fatality over the entire duration of implementation of the Sitewide Removal Alternative.

4.1.12.4 Sitewide Close-In-Place Alternative

Under this alternative, over 64 years DOE and NYSERDA would transport about 0.033 million cubic meters (0.043 million cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal at offsite locations.

As indicated in Table 4–52, about 1,230 truck shipments of radioactive materials would be made under this alternative. Similar to the Sitewide Removal Alternative, under the DOE/Commercial Disposal Option, the Class-C-or-lower low-level radioactive waste for which New York State is responsible would be transported to commercial disposal facilities; and, under the DOE/Commercial Disposal Option, all Class-C-or-lower low-level radioactive waste would be shipped to commercial disposal facilities. Transuranic waste shipments to WIPP are included under both options for purposes of analysis. No shipments of Greater-Than-Class C waste would be needed under this alternative. If train transport was used, the total number of shipments would be about one-half of those made under truck-only transport (about 615 shipments). The total projected distance traveled on public roads or rail lines transporting radioactive waste to its disposal location under this alternative would range from 4.0 to 4.4 million kilometers (2.5 to 2.7 million miles) for truck transport, and from 2.1 to 2.3 million kilometers (1.3 to 1.4 million miles) for train transport.

Impacts of Incident-Free Transportation

Under this alternative, the highest level of health impacts to transportation workers and the general population would occur under the DOE/Commercial Disposal Option (see Table 4–52). Under this alternative, a very limited amount of Class B/C wastes would be generated. Therefore, the contribution from disposal at a commercial facility would be small. As discussed under the Sitewide Removal Alternative, truck shipments would result in higher crew doses. The impacts are proportional to the distance traveled, and NTS is the farthest distance from WNYNSC of the disposal facilities. In addition, for the general population, the transports to NTS expose a larger number of public along the transportation routes.

Crew—Under this alternative, the expected doses to crew members during the transportation of waste by truck would range from 48 to 51 person-rem, resulting in less than 1 (about 0.020) additional LCF. If train transport was used, the expected doses to crew members during the transportation of radioactive waste under this alternative would range from 1.5 to 2 person-rem, resulting in less than 1 (0.0009 to 0.0012) additional LCF.

Public—Under this alternative, the expected cumulative dose to the general population during transport of radioactive waste by truck would range from 10.4 to 11.5 person-rem, resulting in less than 1 (0.0062 to 0.0069) additional LCF. If train transport was used, the expected doses to the general public during the transportation of waste under this alternative would be about 3 person-rem, resulting in less than about 1 (0.0018) additional LCF.

As discussed under the Sitewide Removal Alternative, if DOE and NYSERDA choose to use a combination of rail and truck transport during the execution of this alternative, the dose to the general population would be between the lowest expected dose of 2.8 person rem associated with train transport and the highest expected dose of 11.5 person-rem associated with all-truck transport. There is no scenario where a combination of train and truck transport would be expected to result in a higher dose to the general population than the all truck option.

Impacts of Accidents During Transportation

For waste shipped under this alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve Class A waste transported in Type A boxes (see Appendix J, Table J–11). These waste transports are expected to occur over a period of 8 years. The maximum reasonably foreseeable probability of a truck accident involving this waste type would be 6.6×10^{-7} per year in a suburban area, while the maximum probability for a rail accident would be 1.3×10^{-7} per year in a suburban area, or approximately 1 chance in a million each year for both truck and rail. The consequences of the maximum foreseeable accident would lead to an MEI and a general population dose of 0.000036 rem and 0.020 person-rem, respectively, if trucks were used, and 0.000072 rem and 0.054 person-rem if rail transport were used. These exposures would result in less than 1 (0.000012 to 0.000032) excess LCF among the exposed population, and would increase the risk to the MEI of developing a latent fatal cancer by 2.2×10^{-8} to 4.3×10^{-8} LCF.

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose-risk to the general population of 0.0007 person-rem over the life of expected transportation shipments, resulting in less than 1 (4.4×10^{-7}) LCF for truck transport under the DOE/Commercial Disposal Option, and a maximum nonradiological accident risk of less than 1 (0.37) fatality for rail transport under the DOE/Commercial Disposal Option (see Table 4–52).

Impacts of Construction and Operational Material and Hazardous Waste Transportation

The impacts of transporting construction/demolition debris, construction materials and erosion control (i.e., concrete, gravel/sand/soil, asphalt, steel, piping, fabric, etc.), and hazardous wastes were also evaluated. The estimated transportation impacts under this alternative would be 79.14 million kilometers (49.18 million miles) traveled, 27 (27.3) accidents, and 1 (0.98) fatality over the duration.

4.1.12.5 Phased Decisionmaking Alternative

DOE and NYSERDA would transport about 0.21 million cubic meters (0.28 million cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal at offsite locations under Phase 1 of this alternative. Almost all of these wastes would be generated and transported over a period of 8 years.

As indicated in Table 4–52, about 12,600 truck shipments of radioactive materials would be made under this alternative. No Greater-Than-Class C wastes would be generated. Similar to the Sitewide Removal Alternative, the Class-C-or-lower low-level radioactive waste for which New York State is responsible would be transported to commercial disposal facilities; and, under the Commercial Disposal Option, all DOE Class-C-or-lower low-level radioactive waste would also be transported to commercial disposal facilities. If train transport was used, the total number of shipments would be about one-half of those made under truck-only transport (about 6,300 shipments). The total projected distance traveled on public roads or rail transporting waste to its disposal location under this alternative would range from about 41 to 49 million kilometers (about 25.6 to 30.6 million miles) for truck transport, and from 22 to 27 million kilometers (13.7 to 16.8 million miles) for train transport.

Impacts for the entire Phased Decisionmaking Alternative would depend on the decisions about Phase 2 actions. If the decision is removal of the remaining wastes, transportation risks for this alternative (Phase 1 and Phase 2) would be about equal to those evaluated under the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure, the transportation risks from the additional activities (Phase 2) would be less than those evaluated under the Sitewide Close-In-Place Alternative due to removal activities already performed under Phase 1 of the Phased Decisionmaking Alternative. However, the total transportation risks for both phases would be greater than those for the Sitewide Close-In-Place Alternative.

Impacts of Incident-Free Transportation

Under Phase 1 of this alternative, the highest level of health impacts to transportation workers and the general population would be from activities similar to those explained under the Sitewide Removal Alternative.

Crew—Under this alternative, the expected doses to crew members during the transport of waste by truck would range from 274 to 403 person-rem, resulting in less than 1 (0.16 to 0.24) additional LCF. If train transport was used, the expected doses to crew members during the transport of radioactive waste under this alternative would be about 11 person-rem, resulting in less than about 1 (about 0.0066) additional LCF.

Public—Under this alternative, the expected cumulative dose to the general population during the transport of waste by truck would range from 59 to 71 person-rem, resulting in less than 1 (0.035 to 0.043) additional LCF. If train transport was used, the expected doses to the general public during the transportation of waste under this alternative would be about 16 person-rem, resulting in less than 1 (about 0.0098) additional LCF.

As discussed for the Sitewide Removal Alternative, DOE and NYSERDA could choose to use a combination of rail and truck transport during the execution of this alternative. In that case, the dose to the general population would be expected to be between the lowest expected dose of about 16 person-rem associated with train transport and the highest expected dose of about 71 person-rem associated with all-truck transport. There is no scenario where a combination of train and truck transport would be expected to result in a higher dose to the general population than the truck only option.

Impacts of Accidents During Transportation

For waste shipped under Phase 1 of this alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve Class B/C waste in a Type A B-25 box for the DOE/Commercial Disposal Option, and Class B/C waste in an HIC for the Commercial Disposal Option (see Appendix J, Table J–11).

For the DOE/Commercial Disposal Option, the probability of this accident would be a maximum of about 2.0×10^{-7} and 3.5×10^{-8} per year for truck and rail transport in a suburban area, respectively. In such an accident, the dose to the general population would be 6.1 and 16 person-rem, respectively, leading to less than 1 (0.0037 and 0.0098) additional LCF for truck and rail transport. Note that the difference between these two doses is proportional to the amount of waste transported by rail and truck. The maximum dose to an MEI from this accident would be 0.022 rem, with a risk of developing a latent fatal cancer of 0.000013.

For the Commercial Disposal Option, the probability of this accident would be about 1.0×10^{-7} and 6.6×10^{-7} per year for truck and rail transport in an urban area, respectively. Given such an accident, the consequences to the general population would be 593 to about 1,190 person-rem, respectively, leading to up to 1 additional LCF for truck and rail transport, (0.36 and 0.71). The difference between these two doses is proportional to the amount of waste transported by rail and truck. The maximum dose to an MEI from a rail accident would be 0.30 rem with a corresponding risk of developing a latent fatal cancer of 0.00018 LCF.

The differences in consequences between the accidents involving an HIC and those involving Type A B-25 boxes are driven by the container structural materials (i.e., a poly-hydrocarbon polymer in an HIC versus structural steel for the Type A box). Accidents involving an HIC would lead to a higher airborne release and greater consequences.

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose-risk to the general population of 0.37 person-rem over the life of expected transportation shipments, resulting in less than 1 (0.00022) LCF for truck transport under the Commercial Disposal Option, and a maximum nonradiological accident risk of 4 (4.0) fatalities for rail transport under the DOE/Commercial Disposal Option (see Table 4–52).

Impacts of Construction and Operational Material and Hazardous Waste Transportation

The impacts of transporting construction/demolition debris, construction materials and erosion control (i.e., concrete, gravel/sand/soil, asphalt, steel, piping, fabric, etc.), and hazardous wastes were also evaluated for Phase 1. The transportation impacts under this alternative would be 7.95 million kilometers (4.94 million miles) traveled, 3 (0.74) accidents, and less than 1 (0.10) fatality over the duration.

4.1.12.6 No Action Alternative

Under the No Action Alternative, a minimal amount of waste would be generated annually compared to the other alternatives. Additional wastes would also be generated through periodic maintenance of facility roofs and NDA/SDA cap replacement activities every 25 years. Thus, for the purposes of analysis and comparisons of waste volumes and transport needs, the impact was evaluated for a 25-year operational period. During each 25-year period, DOE and NYSERDA would transport about 9,500 cubic meters (12,400 cubic yards) of radioactive waste, construction debris, and hazardous waste for disposal at offsite locations.

Under this alternative, no Class B/C, transuranic, or Greater-Than-Class C wastes would be generated. As indicated in Table 4–52, about 740 truck shipments of radioactive materials would be made under this alternative over a 25-year period. If trains were used, the total number of shipments would be about one-half of those made under truck-only transport. The total projected distance traveled on public roads or rail transporting radioactive waste would range from 2.4 to 2.9 million kilometers (1.5 to 1.8 million miles) for truck transport, and from 1.30 to 1.5 million kilometers (0.81 to 0.94 million miles) for train transport.

Impacts of Incident-free Transportation

The highest level of health impacts to transportation workers and population from all transportation activities would occur under the DOE/Commercial Disposal Option (see Table 4–52). As stated under the Sitewide Removal Alternative, this is because the impacts are proportional to distance traveled, and NTS is the farthest distance from the WNYNSC of transport options.

Crew—Under this alternative, the expected doses to crew members during the transportation of waste by truck would range from about 39 to 47 person-rem, resulting in less than 1 (0.023 to 0.028) additional LCF. If train transport was used, the expected doses to crew members during the transport of radioactive waste under this alternative would be up to about 2 person-rem, resulting in less than 1 (0.0012) additional LCF.

Public—Under this alternative, the expected cumulative dose to the general population during the transport of waste by truck would range from about 12 to 15 person-rem, resulting in less than 1 (0.0073 to 0.0088) additional LCF. If train transport was used, the expected doses to the general public during the transport of waste under this alternative would be about 3 person-rem, resulting in less than 1 (about 0.0019) additional LCF.

As discussed for the Sitewide Removal Alternative, if DOE and NYSERDA choose to use a combination of rail and truck transport during the execution of this alternative, the dose to the general population would be expected to be between the lowest expected dose of about 3 person-rem associated with train transport and the highest expected dose of 15 person-rem associated with all-truck transport. There is no scenario where a combination of train and truck transport would be expected to result in a higher dose to the general population than the truck only option.

Impacts of Accidents During Transportation

For the wastes transported under this alternative, the maximum reasonably foreseeable offsite truck or rail transportation accident with the highest consequence would involve Class A waste in a B-25 box for both disposal options (see Appendix J, Table J–11). The probabilities of a truck or rail accident involving this type of waste shipment are slightly different. The probability of a truck accident with maximum consequence involving this waste type would be 4.8×10^{-7} per year, while the probability for a rail accident would be 8.4×10^{-8} per year. The consequences of the maximum foreseeable accident would lead to an MEI and a general population dose of 0.000036 rem and 0.020 person-rem, respectively, if trucks were used, and 0.000072 rem and 0.054 person-rem if rail were used. These exposures would result in less than 1 (0.000012 to 0.000032) excess LCF among the exposed population, and would increase the risk to the MEI of developing a latent fatal cancer by 2.2×10^{-8} to 4.3×10^{-8} LCF.

Estimates of the total transportation accident risks for all projected accidents involving waste shipments, regardless of waste type, under this alternative are as follows: a maximum radiological dose-risk to the general population of about 0.0007 person-rem over 25 years, resulting in 4.3×10^{-7} LCF for truck transport in the DOE/Commercial Disposal Option, and a maximum nonradiological accident risk of less than 1 (0.20) fatality for rail transport in the DOE/Commercial Disposal Option (see Table 4–52).

Impacts of Construction and Operational Material and Hazardous Waste Transportation

This alternative would require minimal transport of materials for monitoring and maintenance operations. The impacts of transporting clean debris and hazardous wastes to local landfills were evaluated. The estimated transportation impacts under this alternative would be 0.018 million kilometers (0.011 million miles) traveled, less than 1 (0.006) accident, and less than 1 (0.0004) fatality over 25 years.

4.1.13 Environmental Justice

Environmental justice addresses the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations that could result from implementation of the alternatives in this EIS. In assessing the impacts, the following definitions were used:

- *Minority individuals*: Individuals who identify themselves as members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, two or more races, or some other race.

- *Minority populations:* Minority populations are identified where either: (1) the minority population of the affected area exceeds 50 percent, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

- *Low-income population:* Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the Census Bureau's Current Population Reports, Series P60, on *Poverty in the United States* (Census 2000). Canadian low-income populations were identified from low-income measures from Statistics Canada (Giles 2004).

Consistent with the impact analysis for the public and occupational health and safety, the affected populations are defined as those minority and low-income populations that reside within an 80-kilometer (50-mile) radius centered on WNYNSC. Low-income populations and minority populations residing within this radius are identified in Chapter 3, Section 3.12, of this EIS.

Adverse health effects are measured in terms of risks and rates of exposure that could result in LCFs, as well as other fatal or nonfatal adverse impacts on human health. Disproportionately high and adverse human health effects would occur if the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. The minority and low-income populations are subsets of the general public residing around the site, and all are exposed to the same hazards generated from various operations at the site. Therefore, estimates for environmental justice impacts were determined using either the human health risks results or similar methods provided in this chapter.

4.1.13.1 Decommissioning Period Impacts

No disproportionately high and adverse environmental impacts on minority and low-income populations would occur during the decommissioning period under any of the alternatives for this EIS. This conclusion is a result of investigations in this EIS that determined there would be no significant impacts on human health or ecological, cultural, paleontological, socioeconomic, or other resource areas described in this chapter.

As discussed in Section 4.1.9.1 of this chapter, radiological and hazardous chemical risks to the public resulting from decommissioning actions would be small. These actions at WNYNSC are not expected to cause fatalities among the general population, including minority and low-income populations living within the potentially affected area. An analysis was performed of a high-fish consumption lifestyle for individuals on the lower reaches of Cattaraugus Creek. Such an individual could be a member of the Seneca Nation of Indians. This analysis showed that the projected doses from normal operations under any of the decommissioning alternatives would not be expected to adversely impact this individual during the decommissioning actions.

Even lower doses are projected for the post-decommissioning time period for the decommissioning alternatives, as indicated in Section 4.1.9.1.

Annual radiological risks to the offsite population that could result from facility accidents discussed in Section 4.1.9.2 were estimated to be less than 1 LCF for all decommissioning alternatives over the decommissioning action time periods. These risks are not expected to disproportionately impact minority or low-income populations. The general population surrounding the site is not made up of a disproportionate number of minority or low-income individuals, as discussed in Chapter 3, Section 3.12, of this EIS.

4.1.13.2 Long-term Impacts

Section 4-4 of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," directs that Federal agencies "whenever practical and appropriate, shall collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence" and "shall communicate to the public the risks of those consumption patterns."

In the analysis of long-term impacts, which is discussed in Section 4.1.10, Long-term Human Health, of this chapter and in Appendix H of this EIS, one of the scenarios is a Seneca Nation of Indians receptor who is postulated to consume a large amount of fish that was raised in the lower reaches of Cattaraugus Creek or in Lake Erie near the point where Cattaraugus Creek discharges into the lake. This scenario is conservative for the large amount of fish in the diet, the assumption that the fish was raised in the area, and the assumption that Cattaraugus Creek water is used for drinking and irrigation. Nevertheless, assuming indefinite continuation of institutional controls, the peak annual total effective dose to a Seneca Nation of Indians receptor would be approximately one-half millirem for both the Sitewide Close-In-Place Alternative and No Action Alternatives. The projected doses to the Seneca Nation of Indians receptor would not be expected to adversely impact this individual, and there would be no disproportionately high and adverse impacts to the Seneca Nation of Indians as a result of long-term operations with continuation of institution controls.

4.2 Cost Benefit Considerations

The various decommissioning actions involve the investment of money and worker and public exposure in the interest of reducing future public exposure. This section presents the costs for the various alternatives in present value terms to facilitate direct comparison of different expenditures patterns for the alternatives. The section also presents information on the worker and public doses that are estimated to occur during decommissioning actions and during a 1,000-year period of follow-up monitoring and maintenance or long-term stewardship for each decommissioning alternative (see Section 4.2.2 of this chapter). This information was used to estimate an incremental cost-effectiveness of each decommissioning alternative in terms of its incremental cost per avoided person-rem. This type of information is useful when comparing alternatives. A summary of the cost benefit assessment is given in **Table 4–53**.

Table 4–53 Cost/Benefit Comparative Assessment [a]

Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1 only)*	*No Action Alternative*
The Sitewide Removal Alternative would be effective in removing essentially all of the site radionuclide inventory from the accessible environment. The discounted cost per avoided person-rem is estimated to be about $20,000.	The Sitewide Close-In-Place Alternative would be effective in keeping most of the site radionuclide inventory out of the accessible environment. The incremental discounted cost per avoided person-rem (incremental cost-effectiveness) is estimated to be about $2,000.	The cost-effectiveness of this alternative would be driven primarily by the Phase 2 decision. If the Phase 2 decision is timely removal of the remaining WMAs, the incremental cost-effectiveness ($20,000) would be similar to the Sitewide Removal Alternative. If the Phase 2 decision is timely in-place closure for the remaining WMAs, the incremental cost-effectiveness ($4,500) would approach that of the Sitewide Close-In-Place Alternative.	The No Action Alternative serves as a baseline for assessing the cost-effectiveness of the decommissioning alternatives.

WMA = Waste Management Area.

[a] The assessment is based on the analysis summarized in Table 4–56 of this chapter. Cost-benefit analysis is not typically included in a DOE EIS but is included in NRC EISs. The cost-benefit analysis presented in this EIS is intended to increase the utility of the document to the NRC.

4.2.1 Cost

The dollar expenditure patterns vary among the different alternatives, based on the timing and duration of the decommissioning actions. For example, the Sitewide Removal Alternative decommissioning actions extend for 64 years, after which there would be no need for long-term stewardship. This is reflected in the pattern of costs, with high costs for the 64 years, followed by no additional costs. In contrast, under the No Action Alternative, the site would be maintained indefinitely at the starting point of this EIS. Thus, for the No Action Alternative there would be no initial decommissioning expenditures, but there would be annual monitoring and maintenance costs that would continue indefinitely. The Sitewide Close-In-Place Alternative would incur initial decommissioning costs for 7 years, followed by annual long-term stewardship costs. Under the Phased Decisionmaking Alternative, Phase 1 costs can be estimated. There would be decommissioning costs for 8 years, followed by a period of studies and site characterization. Phase 2 actions are yet to be determined, but would include further site decommissioning that could range from removal to in-place closure for WMAs not removed as part of Phase 1 actions.

A summary of the costs needed to complete the decommissioning actions, as well as the annual monitoring and maintenance or long-term stewardship cost for each alternative, is presented in **Table 4–54** (WSMS 2008a, 2008b, 2008c, 2008d). The table shows the high initial cost and zero post-decommissioning costs for the Sitewide Removal Alternative and the zero initial cost, but the higher annual monitoring and maintenance cost for the No Action Alternative. The table also shows the costs for the Sitewide Close-In-Place Alternative and the cost for Phase 1 of the Phased Decisionmaking Alternative.

Two bounding cost estimates were prepared for the Phased Decisionmaking Alternative. The first bounding estimate assumes that Phase 2 involves removal of the remaining facilities on a schedule similar to that used for the Sitewide Removal Alternative. In this case, the total present value for Phase 1 and Phase 2 of this alternative would be very similar to the present value of the Sitewide Removal Alternative. The second bounding estimate assumes that Phase 2 involves close-in-place actions for the remaining facilities. In this case, the bounding cost estimate of the present value of the total Phase Decisionmaking Alternative is about 1.8 billion dollars because it involves both removal and close-in-place actions.

Table 4–54 Costs for Environmental Impact Statement Alternatives

Cost Element	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative – Phase 1*	*No Action Alternative*
Cost to complete decommissioning actions (billions of 2008 dollars)	9.7 [a]	1.1	1.2	0
Effective annual costs for monitoring and maintenance or long-term stewardship (millions of 2008 dollars per year)	0	4.1	Not part of Phase 1	12.6
Present value (billions of 2008 dollars) using 3 percent annual cost escalation and 5 percent annual discount for future expenditures	5.7	1.2	1.1 [b]	0.7

[a] The cost estimate of the total Phased Decisionmaking Alternative (Phase 1 plus Phase 2) lies between 1.8 and 5.7 billion present value (2008) dollars.
[b] The Sitewide Removal Alternative cost estimate includes $3.1 billion for disposal of Greater-Than-Class C waste, which is considered uncertain.

4.2.2 Population Dose

There are two major components to the worker and public population doses for each alternative. The first is the population dose that is incurred in carrying out the decommissioning actions (removing or isolating the site facilities and waste, and shipping the waste off site). The second is the time-integrated long-term population dose resulting from any contamination that remains on site. The integration period is 1,000 years, a timeframe that was selected to be consistent with the analytical timeframe used in NRC's license termination assessments. The estimate of the first component is the dose to worker and public populations presented in Section 4.1.9, Human Health and Safety During Decommissioning Activities, and Section 4.1.12, Transportation, of this chapter. The transportation dose estimates used in this particular analysis are those for rail transportation. This mode of transport results in smaller doses than truck transport and thus results in a more favorable incremental cost effectiveness, that is, lower dollar cost per person-rem avoided. The estimate of the second component to worker and public population doses is based on the estimated worker dose from monitoring and maintenance activities and the time-integrated population dose to the Lake Erie/Niagara River water users presented in Section 4.1.10, Long-term Human Health (Table 4–38).

The population dose components and the total population dose for each of the alternatives are presented in **Table 4–55** as summarized from the analyses provided in Sections 4.1.9, 4.1.10, and 4.1.12 of this chapter. The doses for the two fully defined decommissioning alternatives (Sitewide Removal and Sitewide Close-In-Place Alternatives) are given in the first two columns. The doses for the Phased Decisionmaking Alternative are given in the next column. For this alternative, two values are given for each entry. The first estimate assumes the Phase 2 decision is removal of the remaining WMAs. The second estimate assumes the Phase 2 decision is in-place closure for the remaining WMAs. The last column of the table is the information for the No Action Alternative. This alternative serves as the baseline for the cost-effectiveness analysis discussed in Section 4.2.3 of this chapter.

4.2.3 Cost Effectiveness

The information given in the previous sections is used to estimate the following: the total incremental population dose reduction as a result of implementing each decommissioning alternative, the incremental cost to achieve this dose reduction, and the incremental cost-effectiveness of the decommissioning alternative. The results are given in **Table 4–56**. Two values are presented for the Phased Decisionmaking Alternative. As for Table 4–55, the first estimate assumes the Phase 2 decision is removal of the remaining WMAs, while the second estimate assumes the Phase 2 decision is close-in-place for the remaining WMAs.

Table 4–55 Population Dose for Each Alternative

Population Dose Element	Alternative			
	Sitewide Removal	Sitewide Close-In-Place	Phased Decisionmaking [a]	No Action
Dose to the site and transportation worker population incurred in the decommissioning actions (person-rem)	1,151	135	1,114 – 243	0
Dose to the offsite population and to the public along transportation routes incurred in the decommissioning actions (person-rem)	168	30	168 – 88	0
1,000 years of worker dose from monitoring and maintenance activities (person-rem)	0	1,080	0 - 1,080	2,600
1,000 years of dose to the offsite population from contaminant migration from the site (person-rem) [b]	0 [c]	2,100 [f]	0 – 2,100 [f]	252,000 [d]
1,000 years of dose to the offsite population from site maintenance activities (person-rem)	0	53	0 – 53	1,700
Total population dose [e]	1,320	3,400	1,280 – 3,560	256,000

[a] The first number assumes that Phase 2 would be removal of remaining WMAs; the second number assumes in-place closure of WMAs.
[b] This dose is to a population of 971,000. Assuming an annual background radiation exposure of 360 millirem per year, the 1,000-year background dose to this population is estimated to be 350 million person-rem. The population dose from the No Action Alternative (252,000 person-rem) is less than 0.1 percent of background dose for the 1,000-year period.
[c] The population dose would be a small number. However, for this analysis, the maximum benefit is assigned to the removal alternative and the dose is assumed to be zero.
[d] This population dose assumes failure of the Waste Tank Farm after 100 years. This assumption increases the estimated dose reduction for the decommissioning alternatives.
[e] The total population dose includes the dose incurred during the decommissioning actions and also during 1,000 years of follow-up monitoring and maintenance. The total dose is reported to three significant figures to facilitate comparison with the No Action Alternative, which serves as the baseline for the cost-effectiveness analysis.
[f] Assuming indefinite continuance of institutional controls.
Note: Totals may not add due to rounding.

Table 4–56 Population Dose Reduction, Incremental Cost, and Cost-effectiveness for Each Action Alternative

Population Dose Element	Alternative			
	Sitewide Removal	Sitewide Close-In-Place	Phased Decisionmaking [a]	No Action
Total population dose reduction [b] due to decommissioning actions (person-rem)	255,000	253,000	255,000 – 252,000	The No Action Alternative is the baseline
Incremental cost to achieve the dose reduction (billions of present value dollars)	5.0	0.5	5.0 - 1.1	The No Action Alternative is the baseline
Incremental cost-effectiveness, $ (present value)/avoided person-rem	20,000	2,000	20,000 - 4,500	The No Action Alternative is the baseline

[a] The first number assumes that Phase 2 would be removal of remaining WMAs; the second number assumes in-place closure of remaining WMAs.
[b] The dose reduction for each alternative is the difference between the total No Action Alternative dose and the total alternative dose that is incurred during both the period of decommissioning actions and a 1,000-year period of subsequent monitoring and maintenance (refer to the last row of Table 4–55).

4.3 Incomplete and Unavailable Information

Incomplete and unavailable information introduces uncertainty into the consequence analyses presented in this chapter. This section discusses the nature of incomplete and unavailable information for those resource areas having the greatest impact, as identified at the beginning of this chapter. The resource areas and the sections of Chapter 4 where they are discussed are:

- Worker exposure (Section 4.1.9)
- Transportation (Section 4.1.12)
- Waste management (Section 4.1.11)
- Public health and safety during decommissioning actions (Section 4.1.9)
- Human health impacts resulting from long-term release and transport (Section 4.1.10)

The nature of the incomplete or unavailable information for each of these areas and the manner in which the environmental analysis dealt with this data limitation is discussed in the balance of this section. Consistent with the requirements of 40 CFR 1502.22, "Incomplete or Unavailable Information," the discussion includes (1) information that is incomplete or unavailable, (2) relevance of the information to adverse impact, (3) summary of existing credible scientific evidence to support evaluation, and (4) evaluation of impacts. In addition, information is provided that supports the belief that the assessments presented in this EIS are conservative.

4.3.1 Worker Exposure

The exposure to workers carrying out decommissioning actions would depend on the extent and duration of worker exposure to radiation sources, primarily gamma sources. Information that is incomplete or unavailable at this time includes: (1) precise knowledge of the distribution of radionuclides in the waste, particularly the gamma emitters; (2) design details for the facilities that would be used for waste handling and processing; and (3) knowledge of how workers would be used during decommissioning actions.

Further characterization of the radionuclides would only become available during physical characterization effort prior to or as part of decommissioning. Further understanding of facility design or operator assignment would only occur following the development of detailed designs and detailed operating plans, actions that are expected to occur only for the selected action.

Estimates of occupational exposure were developed using labor category-specific exposure rates and resource estimates for each of the labor categories. The category-specific exposure rates were established using historical WVDP occupational exposure information contained in DOE's Radiation Exposure Monitoring System to develop exposure rates specific to 11 labor categories. These exposure rates were used in conjunction with specific labor hour estimates to develop total occupational exposure estimates for the various decommissioning actions. The development of these exposure rates and labor estimates are discussed in a supporting technical report (WSMS 2008e).

The occupational exposure estimates are presented in Section 4.1.9 of this chapter, with the results summarized in Table 4–18. The table shows the total occupational exposure to complete a decommissioning alternative as well as the annual occupational exposure that would occur during any monitoring and maintenance period. A more detailed breakdown of the estimates is contained in the technical reports for each alternative (WSMS 2008a, 2008b, 2008c, 2008d).

The occupational exposure estimates are considered to be conservative because of the conservatism in the development of the labor category-specific exposure rates and the fact that no credit is taken for the decay of the gamma emitters that are expected to control the worker dose (cesium-137, cobalt-60). Active management controls would assure that occupational dose standards are met.

4.3.2 Transportation

The consequences of radioactive waste transportation depend on the extent and duration of worker and public exposure to radiation sources (i.e., waste) being transported during the decommissioning activities and the number and type of shipments that are related to the number of transportation accidents. Information that is incomplete or unavailable at this time for this consequence analysis includes: (1) precise knowledge of the distribution of radionuclides in the packaged waste, particularly the gamma emitters; (2) radiation dose from the waste package shipment arrays; (3) the transportation routes; and (4) how the waste would be shipped (truck, rail, or some combination).

Further characterization of the radionuclides would only become available during the physical characterization effort prior to, or as part of, waste packaging prior to shipment. Estimates of exposure to workers and the general public from incident-free transportation, as well as the consequences of accidents, were developed using methods and codes commonly used for transportation impact analysis. Assumptions about waste package inventory are conservative and resulted in conservative dose estimates. The radionuclide inventory assumed for each waste class is the maximum radionuclide concentration that could be present from decontamination, demolition, or decommissioning of buried wastes in the NDA, SDA, or the waste tanks. The subsequent surface dose rate for each waste class was estimated using inventories of potential gamma emitters, with no credit taken for decay beyond September 2000.

The dose rates from arrays would be known more precisely when the packages are arranged for shipment. Also, details about shipment mode and route would be defined as part of implementing the selected alternative. Uncertainty about disposal locations for low-level radioactive waste was addressed by considering two different waste disposal strategies (DOE plus commercial and total commercial) and both eastern and western low-level radioactive waste sites. Uncertainty about transportation method was addressed by considering both truck and rail shipments.

The doses and risks associated with waste transportation are presented in Section 4.1.12 of this chapter, with the results summarized in Table 4–52. A more detailed breakdown of the estimates is presented in Appendix J of this EIS. The dose and risk estimates are considered to be conservative because of the conservatism in the development of the array dose rate estimate and the fact that no credit is taken for the decay of the gamma emitters that are expected to control the dose (cesium-137, cobalt-60).

4.3.3 Waste Management

The consequences of radioactive waste management depend on the volume and characteristics of the waste that would be generated for each alternative and the actions that would be taken to manage the waste: storage or disposal. Information that is incomplete or unavailable at this time for this consequence analysis includes: (1) the volumes and characteristics of waste that would be generated by each alternative; and (2) the availability of disposal sites for all the waste, particularly commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, transuranic waste, and any high-level radioactive waste.

Estimates of waste volumes by category were developed in the technical reports for each alternative (WSMS 2008a, 2008b, 2008c, 2008d). The estimates are considered to be generally conservative from both the volume and waste category viewpoints. More precise characterization of waste volumes and waste characteristics (e.g., categories) would become available as the waste is generated. Uncertainty about the availability of offsite waste disposal locations for Class B and C, low-level radioactive waste, Greater-Than-Class C waste or non-defense transuranic waste was addressed by analyzing the transportation impacts of shipment of the waste to distant hypothetical disposal sites, as well as the impacts of onsite storage for an indefinite period of time.

The consequences of waste management are discussed in Section 4.1.11 of this chapter, with the results summarized in Tables 4–45 through 4–47.

4.3.4 Public Health and Safety During Decommissioning Actions

The dose and risk consequences to the public from decommissioning actions depend on the release of radionuclides to the local atmosphere and surface waters and the potential accidents that might occur during decommissioning operations and release radionuclides to the atmosphere or local surface waters. Information that is incomplete or unavailable at this time for this consequence analysis includes: (1) more precise information on radionuclides that would be released, and (2) the location and actions of future nearby critical receptors.

Further characterization of the radionuclides would only become available as the decommissioning actions are conducted. Information about accident details (how much is released, what form, where, meteorological or hydrologic conditions) would only become available if an accident were to occur.

Estimates of public exposure and subsequent risk for normal operations were developed using a standard code (GENII Version 2) for estimating doses from atmospheric and liquid releases. Estimates of public exposure and subsequent risk for potential accidents were also developed using a standard code for that type of analysis (MACCS2). Both codes and the methodologies are discussed in Appendix I of this EIS. Estimates of discharges to the atmosphere and surface water were developed in the technical reports for each alternative (WSMS 2008a, 2008b, 2008c, 2008d).

Public exposure and risk estimates are presented in Section 4.1.9 of this chapter, with the results summarized in Tables 4–12 through 4–22. The public exposure and risk estimates are considered to be conservative because of the conservatism in the development of the normal operations release estimate as well as the accident release estimate. A conservative element of the airborne release dose analysis is the neglect of radioactive decay. Many of the radioisotopes (tritium, cobalt-60, strontium-90, and cesium-137) have half-lives that are comparable to or shorter than the decommissioning action timeframe and would therefore decay to an appreciable extent. The analysis also conservatively assumes the individuals and populations breathe contaminated air all the time and that all the food consumed by the individuals and populations was exposed to contaminated air and water. The downstream population estimates are also conservative because no credit is taken for radionuclide removal as part of water treatment systems, and it was assumed that in addition to direct water consumption, the water would be used to irrigate a local garden. An additional conservative factor for downstream receptors is the assumption of contaminated fish consumption where there is immediate accumulation of radionuclides in the fish to levels that are consistent with long-term bioaccumulation factors. Public accident risk estimates include conservative assumptions regarding emergency response actions, radiological source terms, and meteorology.

4.3.5 Human Health Impacts Resulting from Long-term Release and Transport

The estimates of long-term doses and risk to individuals (see Section 4.1.10) are the result of a complex series of calculations that involve estimates of initial hazardous and radiological material inventory and form, estimates of rates for moving these constituents from their original location through the environment taking into account interactions between the various environmental components of the environment (e.g., water, sediment, vegetation, and fish), and finally, estimates of human use of, or interaction with, the contaminated environment.

The major elements of incomplete or unavailable pieces of information that are used in these calculations are:

- Characterization of the amount, chemical form, and physical distribution of hazardous materials (radionuclides and toxic chemicals) in the various locations including contaminated soil and sediment, buried waste, buildings, and underground tanks. The analysis for the No Action Alternative assumes the material remains in its present form, while the analysis for the Sitewide Close-In-Place Alternative assumes modification of the waste form due to the addition of material such as grout.

- Characterization of engineered barriers and their performance over long periods of time. Engineered barriers considered in the analysis include grout that is intended to reduce the mobility of hazardous constituents, hydraulic barriers intended to reduce the flow of water to and from areas containing hazardous constituents, absorptive barriers (possibly part of hydraulic barriers) intended to reduce the hydrologic transport of hazardous constituents, and intrusion barriers intended to limit human intrusion into specific areas such as these containing high concentrations of hazardous materials.

- Knowledge of present site hydrology and how this could be modified by the engineering that would be conduced for each alternative.

- Knowledge of present and long-term groundwater chemistry.

- Knowledge of the hydrologic release rates of hazardous materials from the various locations (release rates that could be influenced by water chemistry changes that could occur over time and by engineered barriers).

- Knowledge of erosion mechanisms and rates across various portions of the site, both of which can change with time and be influenced by human actions.

- Knowledge of the long-term erosion-driven release rates of hazardous materials that are a function of waste properties, waste-covering soil and rock properties, and climate.

- Knowledge of the form of hazardous constituents that are released to surface streams and how these constituents would interact with the surface water environment through processes such as adsorption or deposition.

- Knowledge of how plants and animals would come in contact with contaminated environmental media and would bioconcentrate hazardous constituents.

- Knowledge of timing and location of future human activities, including construction of wells in contaminated aquifers, the treatment and use of water from such wells, the consumption of foods (plants and animals) that have come in contact with contaminated media, and the construction and use of homes and gardens in contaminated settings.

Even though there is incomplete information, there is a substantial body of knowledge of some of the above factors which does form a basis for developing informative, comparative estimates of long-term consequences.

Long-term dose estimates were developed using integrated site-specific release, transport, and consequence codes that build on:

- Available information on hazardous material inventory and form.

- Available site geologic and hydrologic information which was used to develop a sitewide 3D hydrologic model.

- Available long-term site-specific erosion information which was used to calibrate two state-of-the-art landscape evolution models as a basis for erosion predictions.

The integrated models are consistent with theoretical approaches commonly accepted by the scientific community involved in environmental impact assessment.

The integrated models are considered to provide conservative predictions for the receptors analyzed for several reasons. The models:

- Assume a moderate degree of degradation of hydraulic barriers (one order of magnitude for clay layers and two orders of magnitude for drainage layers), thereby increasing the rate of waste removal by hydrologic processes.

- Assume conservative (low end of the spectrum) partitioning coefficients for materials for which there is no site-specific information, thereby increasing the rate of waste removal by hydrologic processes.

- Take no credit for loss of hazardous material by adsorption or deposition processes after it enters surface streams, thereby increasing the concentration of hazardous materials in downstream waters.

- Assume high bioaccumulation factors with no uptake rate limits, as well as high fish consumption rates for specific receptor locations, thereby increasing the concentration of hazardous materials in vegetation, animals, and fish.

- Assume no water treatment that would reduce the concentration of hazardous material in drinking or irrigation water, thereby increasing the concentration of hazardous materials in water used for drinking or irrigation.

- Assume no dilution of Cattaraugus Creek flow from the point of discharge into Lake Erie until it is mixed with the flow in the east channel of the Niagara River, thereby increasing the concentration of hazardous materials in the Niagara River.

The uncertainty consequences to potential future human receptors are accommodated by analyzing a range of potential receptors, all of which are considered to be on the conservative end of the spectrum with respect to location and behavior. Specific details of implementation of the dose calculation that contribute to the conservative dose calculation include:

- Multiple pathways whenever it appears possible (e.g., house construction in contaminated soil, home garden in the contaminated soil, and well in the contaminated aquifer with the water used [without treatment] for drinking and gardening).

- Use of high-end estimates for utilization rates (ingestion rates for drinking water and fish).

- Longer (conservative) exposure times for hunters and hikers.

4.4 Intentional Destructive Acts

The environmental impacts of intentional destructive acts (IDAs), also known as intentional malevolent acts or terrorist incidents, were analyzed at the West Valley Site for each of the four alternatives. The vulnerability of the site to IDAs is different for each of the decommissioning alternatives and for the No Action Alternative. Two measures of IDA vulnerability are considered in this analysis: maximum potential IDA scenario consequences and overall vulnerability.

The results of the assessment are summarized in **Table 4–57**. The IDA having the maximum potential consequence, the energetic release of contamination from the high-level radioactive waste tank, is the same for all the alternatives because the tank exists for some period of time under all the alternatives. The overall vulnerability of the alternatives to IDAs considers waste handling and movements that are part of the alternative and affect the vulnerability of material over time. (Overall vulnerability is a qualitative metric for the quantity of radioactive material at risk for a postulated IDA scenario coupled with the relative time period that this material would remain susceptible to an IDA at the WNYNSC.) The results of the overall vulnerability assessment on a relative scale are shown in the last row of Table 4–57.

Table 4–57 Impacts of Intentional Destructive Acts

	Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1)* [a]	*No Action Alternative*
Maximum potential consequences on site	Dispersal of high-level radioactive waste tank inventory	Dispersal of high-level radioactive waste tank inventory	Dispersal of high-level radioactive waste tank inventory	Dispersal of high-level radioactive waste tank inventory
Maximum potential consequences during transportation	Dispersal of fuel and hardware drum and Greater-Than-Class C drum inventory	Dispersal of Greater-Than-Class C drum inventory	Dispersal of Greater-Than-Class C drum inventory	Dispersal of Class A box inventory
Overall vulnerability	High	Medium	Medium	Highest

[a] This assessment is based only on the consideration of Phase 1 decommissioning actions. The overall vulnerability could be higher after Phase 2 decommissioning actions are defined.

The potential impacts of IDAs are estimated by identifying and evaluating potential scenarios. The scenarios can involve larger release quantities or greater dispersion than those estimated for accidents in Section 4.1.9 of this chapter. Additional information on methodology and discussion of results are presented in Appendix N of this EIS.

The likelihood of these events and consequences may be mitigated by measures to: (1) reduce the probability of occurrence; (2) provide timely response to emergency situations; and (3) facilitate long-term recovery through long-term response actions including monitoring, remediation, and support for affected communities and their environment.

4.5 Cumulative Impacts

CEQ regulations (40 CFR Parts 1500-1508) define cumulative impacts as effects on the environment that result from implementing the Proposed Action or any of the alternatives when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR 1508.7). Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource irrespective of the proponent (EPA 1999a).

Cumulative impacts can result from individually minor but collectively significant actions taken over a period of time. Cumulative impacts can also result from spatial (geographic) and/or temporal (time) crowding of environmental perturbations (i.e., concurrent human activities and the resulting impacts on the environment are additive if there is insufficient time for the environment to recover).

The analysis of cumulative impacts for this EIS has shown that generally most other actions in the region do not add in a cumulative manner to those resulting from the decommissioning actions. The only exceptions are:

- The reasonably foreseeable activities at WNYNSC (shipment of existing waste inventories, removal of unnecessary facilities) will be largely completed before decommissioning starts, but there is the potential for some additional consequences. (See Section 4.5.2 of this chapter.)
- The construction of the U.S. Route 219 Freeway would reduce traffic on local U.S. Route 219 (a positive impact) but would disturb land, change land use, could negatively impact ecological resources through habitat fragmentation, and would have local impacts on water quality as a result of construction and road surface runoff. The construction of the freeway would result in a noticeable addition to local employment. (See Section 4.5.3 of this chapter.)
- The construction of wind powered electrical generation towers would disturb land, change land use, impact visual resources, and negatively impact wildlife (birds and bats). The construction and operation of these facilities would result in a noticeable addition to local employment. (See Section 4.5.3 of this chapter.)

The approach used to identify and estimate cumulative impacts for this *Decommissioning and/or Long-Term Stewardship EIS* was to:

- Review literature and contact individuals and organizations to identify recent and reasonably foreseeable actions at WNYNSC and in the region;
- Review available environmental documentation to understand the impacts of the actions identified at WNYNSC and in the region; and
- Describe the cumulative impacts of applicable activities.

Cumulative impacts were assessed by combining the potential effects of EIS alternative activities with the effects of other past, present, and reasonably foreseeable actions in the ROI. Some of these actions would occur at different times and locations, and may not be truly additive (cumulative). For example, the set of actions that impact air quality occur at different times and different locations across the ROI, and, therefore, it is unlikely that the impacts would be completely additive.

4.5.1 Past and Present Actions at the Western New York Nuclear Service Center

The impacts of past actions at WNYNSC have resulted in the affected environment, which is described in Chapter 3 of this EIS. The most important impact of past actions, which include spent reactor fuel storage; spent reactor fuel reprocessing; high-level radioactive waste vitrification; treatment and disposal of waste, and some decontamination and facility removal, is the presence of facilities and residual contamination that are the scope of this EIS.

4.5.2 Reasonably Foreseeable Actions at the Western New York Nuclear Service Center

Reasonably foreseeable onsite actions at WNYNSC included in the cumulative impact analysis of this EIS are ongoing waste management, decontamination, and facility removal activities. These are summarized in

Table 4–58. Future actions that are speculative or not well defined were not analyzed, including the future use of WNYNSC.

Table 4–58 Reasonably Foreseeable Onsite Actions at the Western New York Nuclear Service Center

Activity	*Description*
Waste treatment, storage, and disposal	Low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, and high-level radioactive waste currently stored at WNYNSC would be packaged for shipment off site for treatment and disposal (DOE 2003e, 2006b).
Dispose of 36 surplus facilities	Thirty-six facilities that are no longer needed (some lightly contaminated) are being decontaminated, dismantled, removed, and disposed of over a 4-year period (DOE 2006c).
Completion of EIS starting point actions	The major actions that are part of achieving the EIS starting point identified in Chapter 2 are: (1) installation of a geomembrane cap over the NDA, (2) installation of a permeable treatment wall and permeable reactive barrier on the leading edge of the North Plateau Groundwater Plume, (3) installation of the Waste Tank Farm tank and vault drying system, and (4) decontamination of the Main Plant Process Building so that it is demolition ready.

Waste treatment, storage, and disposal activities were evaluated in the *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (WVDP WMEIS)* (DOE 2003e) and the *West Valley Demonstration Project Waste Management Environmental Impact Statement, Supplement Analysis, Revised Final*, prepared in 2006 (DOE 2006b). The *WVDP WMEIS* was prepared to determine how DOE should disposition the operations and decontamination wastes that are in storage or will be generated over a 10-year period. In the ROD for the *WVDP WMEIS* (70 FR 35073), DOE decided to partially implement Alternative A: offsite shipment of high-level radioactive waste, low-level radioactive waste, mixed low-level radioactive waste, and transuranic waste for disposal. Consistent with the *Waste Management Programmatic EIS High-Level Waste* ROD (64 FR 46661), DOE will safely store canisters of vitrified high-level radioactive waste at the WVDP Site until transfer for disposal in a geologic repository. DOE is deferring a decision on the disposal of WVDP transuranic waste, pending a decision supported by the *GTCC EIS*, currently in preparation, which will address disposal of Greater-Than-Class C and non-defense transuranic waste. DOE will ship low-level radioactive waste and mixed low-level radioactive waste off site for disposal. DOE did not evaluate hazardous and nonhazardous waste management in the *WVDP WMEIS*.

The disposal of 36 surplus facilities was evaluated in the *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project* (DOE 2006c). This EA examined the environmental impacts of decontaminating, dismantling, removing, and disposing of 36 facilities that are no longer needed.

Most of these actions will have been completed prior to the start of decommissioning actions. Only moderately small volumes of waste, some of which is orphan waste, are likely to remain on site. The impacts of managing this waste would add to the impacts of managing decommissioning waste.

4.5.3 Other Reasonably Foreseeable Actions in the Region

Regional actions that could contribute to cumulative effects could include future State or local development initiatives, new industrial or commercial ventures, new utility or infrastructure construction and operation, new waste treatment and disposal facilities, and new residential development. Data were collected from the Village of Springvale and Town of Ellicottville; counties of Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Niagara and Wyoming in New York; and McKean, Potter and Warren in Pennsylvania; regarding anticipated future activities that could contribute to cumulative impacts. The Village of Springville

(Kaleta 2008); Allegany, Livingston, and Niagara Counties in New York (Ferrero 2008, Fisk 2008, Risky 2008); and McKean, Potter, and Warren Counties in Pennsylvania (Dietrich 2008, Glotz 2008, Lunden 2008) did not identify any major future actions that would be expected to contribute to cumulative impacts at WNYNSC. Activities identified in the region surrounding WNYNSC include:

- Continued fast-paced development in the northern and mid-county region of Erie County, New York (Opalka 2008), approximately 28 kilometers (17 miles) north of WNYNSC.
- Redevelopment of Lake Erie waterfront areas in the Cities of Buffalo and Lackawanna, New York (Opalka 2008), approximately 38 kilometers (24 miles) north of WNYNSC.
- Erie County Water Authority service extensions in southern Erie County (Opalka 2008).
- Residential development around the two ski resorts in the Towns of Ellicottville and Mansfield, Cattaraugus County, New York (Isaacson 2008, Horowitz 2008), approximately 17 kilometers (11 miles) south of WNYNSC.
- Conversion of the Laidlaw Power Plant in Ellicottville, Cattaraugus County, New York, from natural gas to clean wood chips. The facility would process approximately 63,503 metric tons (70,000 tons) of clean wood waste per year and generate 50 million kilowatt hours of electricity (Isaacson 2008), approximately 16 kilometers (10 miles) south of WNYNSC.
- Electrical generation project at the Chautauqua County Landfill (Moore 2008), approximately 58 kilometers (36 miles) southwest of WNYNSC.
- Proposed wind farm developments in Allegany, Chautauqua, Erie, Genesee, and Wyoming Counties (E&E 2006, Noble Allegany Windpark, LLC 2008, Noble Wethersfield Windpark, LLC 2007, Opalka 2008, Town of Alabama 2008, Town of Arkwright 2008, Town of Perry 2006), between 26 kilometers (16 miles) and 72 kilometers (45 miles) from WNYNSC.

Because of the distance from WNYNSC and the localized environmental effects of these actions, they are not expected to interact with WNYNSC activities to produce cumulative impacts.

Additional information about future activities that could contribute to cumulative impacts was collected from the U.S. Forest Service, U.S. Department of Defense, EPA, U.S. Army Corps of Engineers, New York State Department of Environmental Conservation, and New York State Department of Transportation. Portions of the Allegheny National Forest in McKean and Warren Counties, Pennsylvania, are within 80 kilometers (50 miles) of WNYNSC. A number of activities were identified that are expected to occur within the Allegheny National Forest during the period of analysis for this EIS. These include land management; vegetation management (including fuels management and overstory removal); watershed management (including management of wildlife, fish, and rare plants); road, recreation, heritage, and scenery management; minerals management (including construction and operation of oil and gas wells and pipelines); and forest products management (USFS 2008). Because these activities are farther than 48 kilometers (30 miles) from WNYNSC, are largely the continuation of ongoing activities in the Allegheny National Forest, and produce only localized environmental effects, they are not expected to interact with WNYNSC activities to produce cumulative impacts.

In May 2005, the U.S. Department of Defense announced its latest round of base realignment and closures (AFIS 2005, DoD 2005). Base realignment and closure can impact areas around military facilities by changing direct and indirect employment and through other activities that produce environmental impacts. The Navy Recruiting District Headquarters in Buffalo, New York, is the only military facility in the WNYNSC ROI that would be affected. Closure of this facility is expected to result in the loss of 53 jobs (37 direct and 16 indirect) in the region (DoD 2005). Because this facility is over 48 kilometers (30 miles) from the WNYNSC boundary, no cumulative impacts are expected.

The EPA National Priorities List (also known as Superfund sites) was reviewed to determine whether these sites could contribute to cumulative impacts at WNYNSC (EPA 2007a, 2007b). Nine active National Priorities List sites are located within 80 kilometers (50 miles) of WNYNSC. The closest National Priorities List site is the Peter Cooper site near Gowanda, New York, approximately 19 kilometers (12 miles) west of WNYNSC. The State of New York also actively pursues cleanup of contaminated sites through the State Superfund, Environmental Restoration, Brownfield Cleanup, and Voluntary Cleanup Programs (NYSDEC 2006c, 2008d). There are over 300 State of New York sites in the counties within 80 kilometers (50 miles) of WNYNSC. Of this, 24 sites are located in Cattaraugus County, and 143 sites in Erie County. Most of the sites in Erie County are located in the Buffalo metropolitan area. The three State of New York sites closest to WNYNSC are:

- Machias Gravel Pit site near Machias, New York, in Cattaraugus County, approximately 10 kilometers (6 miles) southeast of WNYNSC;
- CID Landfill, Inc., site near Sardinia, New York, in Cattaraugus County, approximately 14 kilometers (8.7 miles) northeast of WNYNSC; and
- Signore, Inc. site in Ellicottville, New York, in Cattaraugus County, approximately 16 kilometers (9.9 miles) south of WNYNSC.

In addition to being at some distance from WNYNSC, most of these EPA Superfund and State of New York sites are well into the control and cleanup process and therefore are not expected to contribute to cumulative impacts.

Seven sites in the ROI have been, or are being, remediated under the Formerly Utilized Sites Remedial Action Program (USACE 2008a, 2008b). This program was initiated in 1974 to identify, investigate, and cleanup or control sites that were part of the nation's early Atomic Energy and weapons programs. Because these 7 sites are not an imminent hazard to persons living near them, are located between 56 and 80 kilometers (35 and 50 miles) north-northwest of WNYNSC, and most are well into the control and cleanup process, they are not expected to contribute to cumulative impacts at WNYNSC.

The State of New York Department of Environmental Conservation leases oil and gas development rights on State lands. All parcels offered for lease in 2006 are outside the 80-kilometer (50-mile) radius of WNYNSC (NYSDEC 2006b), and therefore, are not expected to add to cumulative impacts.

There are plans for six wind projects that could be constructed in the next few years within 80 kilometers (50 miles) of WNYNSC (AWEA 2006, Horizon 2008, Noble 2008). These projects are:

- Dairy Hills Wind Farm in Wyoming County (Town of Perry 2006), approximately 63 kilometers (40 miles) northeast of WNYNSC;
- New Grange Wind Farm in Chautauqua County (Town of Arkwright 2008), approximately 46 kilometers (29 miles) west of WNYNSC;
- Alabama Ledge Wind Farm in Genesee County (Town of Alabama 2008), approximately 75 kilometers (45 miles) north of WNYNSC;

- Allegany Wind Park in Allegany County (Noble Allegany Windpark, LLC, 2008), approximately 26 kilometers (16 miles) east of WNYNSC;

- Bliss Wind Park in Wyoming County (E&E 2006), approximately 27 kilometers (17 miles) northeast of WNYNSC; and

- Wethersfield Wind Park in Wyoming County (Noble Wethersfield Windpark, LLC, 2007), approximately 54 kilometers (34 miles) northeast of WNYNSC.

These projects would involve the construction of 378 wind turbines generating a total of 634 megawatts of electricity. The projects would disturb land (714 hectares [1,765 acres] for all the projects) and result in visual impacts (378 turbines, each approximately 120 meter [400 feet] tall, and each with three 90-meter [290-foot] rotating blades). In addition, there are a number of cell phone towers in proximity to WNYNSC, most along the U.S. Route 219 corridor (MOBILEDIA 2007). Cellular phone towers are generally 15 to 61 meters (50 to 200 feet) high (FCC 2006) and are often visible from some distance. Wind turbines and cell phone towers are considered in the cumulative impact analysis.

Information on transportation projects was collected to determine if major projects could impact the region around WNYNSC. A number of transportation projects are ongoing or planned (EFLHD 2008; NYSDOT 2008a). Most of these are relatively minor maintenance, upgrade, and resurfacing projects; and some are more substantial improvement, reconstruction, and rehabilitation projects. Only the U.S. Route 219, Springville to Salamanca Freeway (USDOT and NYSDOT 2003b), would involve the disturbance of substantial areas of land near WNYNSC. The nearest portion of the new U.S. Route 219 Freeway lies approximately 1.5 kilometers (0.93 miles) from the western boundary of WNYNSC. This project is considered in the cumulative impact analysis.

4.5.4 Results of the Cumulative Impact Analysis

The following resource areas have the potential for cumulative impacts: land use and visual resources, site infrastructure (i.e., electricity, natural gas, and water use), geology and soils, water resources, air quality and noise, ecological resources, cultural resources, socioeconomics, public health and safety, occupational health and safety, waste management, transportation, and environmental justice. The level of detail provided for each resource area is dependent on the extent of the potential cumulative impact. Many resources were not provided with a detailed analysis based on minimal or localized impacts from WNYNSC operations and an assessment that, cumulatively, there would be no appreciable impacts to these resources.

4.5.5 Land Use and Visual Resources

Land Use – The reasonably foreseeable actions and the decommissioning alternatives at WNYNSC would largely occur within the disturbed portion of the site. Only remediation of the Cesium Prong and implementation of erosion control measures would occur outside the disturbed area.

The new U.S. Route 219 Freeway would not disturb land on WNYNSC, but would disturb 98.2 hectares (243 acres) of agricultural land, 46.5 hectares (115 acres) of urban land, 16.4 hectares (40.5 acres) of water and wetlands, 306 hectares (755 acres) of forest, and 74.5 hectares (184 acres) of old fields, for a total of 541 hectares (1,337 acres). The freeway would also require the relocation of 63 residences (35 houses and 28 mobile homes) and 1 business, and would affect 19 major farm operations. In addition, it was estimated that future development of land around the freeway interchanges could consume another 191.8 hectares (474 acres) (USDOT and NYSDOT 2003b). As described in Section 4.5.3 of this chapter, the 6 wind farms could disturb 714 hectares (1,765 acres) of land in the ROI.

Continued development in the ROI is likely to convert additional forested and agricultural land to residential, commercial, industrial, and infrastructure uses. As described in county planning documents, development would be centered on the towns and cities in the ROI, particularly the Buffalo Metropolitan Area (Cattaraugus 2001, Cattaraugus 2005, Erie-Niagara 2006).

Therefore, the potential changes to land use from WNYNSC decommissioning alternatives would be a very small portion of the potential changes expected in the region and would not be expected to exacerbate cumulative impacts to land use.

Visual Resources – Implementation of WNYNSC decommissioning alternatives could result in an increase in construction and demolition activities as new buildings are built and old buildings demolished. This new construction would not change the current VRM Class IV rating of the disturbed portion of the site. Under some alternatives, contaminated facilities, soil, and groundwater would be removed. Most of these activities would take place within the disturbed portion of WNYNSC and would have minimal further negative visual impact. However, remediation of areas of the Cesium Prong and implementation of erosion control measures located outside the disturbed area, while temporary, would be visible from nearby public vantage points, Route 240, or higher elevations of the site. Upon completion of restoration activities, these areas would be graded and reseeded to stabilize exposed soils. At this stage, these areas would no longer appear industrial and would become more consistent with a higher VRM rating (VRM Class II or III), where the natural landscape would play a more prominent role.

Cumulative visual impacts such as diminished viewsheds and increases in artificial light from residential, industrial, and commercial development on previously undeveloped land could occur. A total of 44 sensitive viewpoints for the new U.S. Route 219 Freeway were identified based on the potential for visual impact. Visual ratings for the new freeway range between negligible and severe. Many of the sensitive viewpoints rated as strong are grouped near settlements where freeway improvements may include structures, interchanges, major cut/fill slopes and where high landscape quality now exists. The new freeway would be visible only from a small portion of the northern WNYNSC Site along Buttermilk Creek and therefore should not substantially contribute to cumulative impacts to visual resources at WNYNSC (USDOT and NYSDOT 2003b).

The construction of the 6 wind energy projects in the ROI could result in the operation of 378 wind turbines. These 120-meter (400-foot) tall structures with 90-meter (290-foot) rotating blades would be visible from some distance. Studies performed to assess the environmental impacts of operation of the wind farms typically analyze visual resource impacts within an 8-kilometer (5-mile) radius of the wind turbines. Beyond this distance, these studies assume that natural conditions of atmospheric and linear perspective significantly mitigate most visual impacts (Town of Arkwright 2008). None of the proposed wind farms is within 8 kilometers (5 miles) of the WNYNSC boundary.

There are a number of cellular phone towers in proximity to WNYNSC, most along the U.S. Route 219 corridor (MOBILEDIA 2007). Cellular phone tower construction is likely to continue in the ROI as cellular phone providers upgrade and fill in gaps in their service areas. Cellular phone towers are generally 15 to 61 meters (50 to 200 feet) high (FCC 2006) and are often visible from some distance. New towers could contribute to cumulative visual impacts in the region near WNYNSC.

Although the decommissioning activities evaluated in this EIS could produce short-term adverse impacts on the visual environment that could add to cumulative impacts, over the long-term, decommissioning would have beneficial effects by reducing the presence of visually intrusive manmade structures at WNYNSC. The visual impact changes associated with WNYNSC decommissioning alternatives would be a very small portion of the potential changes expected in the region from other projects.

4.5.6 Site Infrastructure

For any of the alternatives, the demand for site utilities (e.g., electricity, fuel, and water) during decommissioning would not be additive to the reasonably foreseeable actions at WNYNSC because most of the reasonably foreseeable actions would occur prior to decommissioning. Therefore, there would be no cumulative impacts on the site utility infrastructure.

The projected traffic on the main roads around WNYNSC (NY Route 240 and U.S. Route 219) would be within the capacity of these roads, even for Sitewide Close-In-Place Alternative activities, which would produce the greatest traffic increases. Most of the reasonably foreseeable actions at WNYNSC would occur prior to the decommissioning actions, and therefore would not add to the local traffic impacts.

The U.S. Route 219 Freeway project will link the existing U.S. Route 219 Expressway near Springville to the Southern Tier Expressway, and would provide continuous freeway access with reduced travel time and increased safety from the Buffalo Metropolitan Area to many of the communities on the Southern Tier. The new road will divert most of the truck traffic and long-distance vehicle trips that currently use U.S. Route 219 and is estimated to reduce traffic on the existing road by 2,770 vehicle trips per day near Ashford. As part of the construction of the U.S. Route 219 Freeway, three minor roads near Ashford will be dead-ended: Neff Road, Rock Springs Road, and Scoby Hill Road. Traffic on the new freeway is estimated at 18,090 vehicle trips per day near Ashford (USDOT and NYSDOT 2003b, WIVB 2008). Therefore, traffic impacts from decommissioning activities at WNYNSC would be overshadowed by the impacts from construction and operation of the new freeway, and would not contribute substantially to cumulative impacts in the region.

4.5.7 Geology and Soils

Construction of new facilities and engineered barriers for WNYNSC decommissioning would require use of geologic materials such as gravel, sand, clay, and soil. The geologic material required for the reasonably foreseeable actions at WNYNSC are essentially negligible compared to the material required for decommissioning actions (approximately 425 cubic meters [556 cubic yards] for reasonably foreseeable actions compared to 1,800,000 cubic meters [2,300,000 cubic yards] for the Sitewide Close-In-Place Alternative). Therefore, there would be no cumulative impacts from the use of geologic materials at WNYNSC.

4.5.8 Water Resources

Surface Water – Implementation of decommissioning activities would result in minor short-term impacts on water quality from release of treated water. Most treated water releases from reasonably foreseeable actions at WNYNSC would occur prior to decommissioning activities. Decommissioning activities at WNYNSC would not substantially contribute to adverse cumulative impacts to surface water resources, and would generally produce long-term beneficial results after decommissioning.

The Peter Cooper National Priorities List site is approximately 19 kilometers (12 miles) west of WNYNSC on Cattaraugus Creek. Landfill wastes from this former glue and industrial adhesives manufacturing facility contain elevated levels of chromium, arsenic, zinc, and some organic compounds. In some areas, contaminated leachate is seeping into Cattaraugus Creek (EPA 2006b). Current surface water discharges from WNYNSC to Cattaraugus Creek are very small, and future releases under the decommissioning alternatives are also expected to be very small. These releases would not be expected to have cumulative impacts with the Peter Cooper site. Although releases under some unmitigated erosion scenarios are larger, the maximum impacts from the erosion scenarios would occur in the future after remediation at the Peter Cooper site is scheduled to be completed.

The construction of the new U.S. Route 219 Freeway will traverse 45 perennial and 83 intermittent streams. The new freeway will bridge all of the major creeks, and will result in minimal disturbance to the creek bottoms. All the smaller tributaries will be culverted, which will lead to considerable disturbance to the tributary bottoms. Temporary sedimentation impacts will occur as a result of the construction of culverts, resulting in increased downstream turbidity and increased in-stream siltation. Erosion control structures (i.e., silt fencing and hay bales) will be used during construction to minimize in-stream sedimentation. Additionally, adjacent banks will be revegetated or lined with rip-rap to minimize additional sedimentation during operation of the freeway. These actions will result in temporary impacts to water resources which will subside once construction activities are complete (USDOT and NYSDOT 2003b). All bridges and culverts for the new U.S. Route 219 Freeway will be designed to minimize impacts to floodplains (USDOT and NYSDOT 2003b).

Pollutants from highway use and maintenance, as well as air pollutants from other sources, will accumulate on highway surfaces. These pollutants are carried from the highway surface to adjacent waters by runoff from rainfall and melting snow and ice. Based on current deicing procedures, some localized impacts on surface waters adjacent to the new freeway are likely to occur due to increased chloride concentrations in runoff. The projected lead and zinc concentrations for these drainage basins are projected to be below EPA's acute criteria for the protection of aquatic life.

Stormwater management facilities will be incorporated in the design of the new U.S. Route 219 Freeway to mitigate impacts to surface waters resulting from peak flow, first flush, and pollutant loading. Potential impacts on surface water quality due to the introduction of pollutants such as chloride and copper will be mitigated by controlling the runoff from the highway surface and directing the flow to water bodies less susceptible to degradation. For example, redirecting the runoff into streams having higher rates of flow will result in the contaminants being more diluted and less likely to impact the overall water quality of the stream. In addition, grass-covered swales and drainage ways incorporated into the final design of the highway will be used to reduce total suspended solids. Construction of the freeway will increase the amount of impervious surface area in the drainage basins crossed by only 0.08 percent (USDOT and NYSDOT 2003b).

Overall, surface water impacts from decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

Groundwater – The decommissioning actions would generally improve groundwater quality for the most accessible groundwater source in the disturbed area, the North Plateau Groundwater Plume. The other reasonably foreseeable actions at WNYNSC would not impact groundwater quality.

The U.S. Route 219 Freeway project potentially could impact both the quantity and quality of the groundwater near the new freeway. Groundwater quantity impacts evaluated include changes in discharges to wetlands and the water table due to cut-and-fill operations and the addition of impervious road surfaces. Quantity impacts are expected to have a minimal regional effect on the supply of groundwater within the project area and therefore are not likely to add to the cumulative effects of decommissioning activities at WNYNSC (USDOT and NYSDOT 2003b).

Groundwater quality impacts evaluated for the new U.S. Route 219 Freeway include those due to deicing salt, increased vehicular pollutants, and construction activities. The primary concerns for impacts on groundwater quality arise from the use of road deicing salts and vehicular pollutants such as copper, lead, and zinc. Impacts on groundwater quality, though small, may be long term. Estimates show that even with the additional chloride added to the environment by maintenance of the new freeway, groundwater concentrations would not exceed 250 milligrams per liter, the maximum allowable chloride concentration in drinking water set by NYSDEC. Calculations also indicate that no adverse impacts on groundwater from vehicular pollutants, including copper, lead, and zinc, are expected (USDOT and NYSDOT 2003b). Therefore, cumulative groundwater impacts with decommissioning activities at WNYNSC are unlikely.

Overall, groundwater impacts from decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

4.5.9 Air Quality and Noise

Air Quality – Decommissioning actions would result in temporary, small and localized impacts to air quality. Air quality standards for carbon monoxide, nitrogen oxides, and sulfur oxides would not be exceeded at the WNYNSC boundary or along public roadways. Emission of fugitive dust could result in exceedance of particulate matter standards. The impacts on air quality from reasonably foreseeable activities at WNYNSC would be less than those from decommissioning actions and would occur earlier in time; hence, they would not be additive.

Annual emissions of greenhouse gases in the form of carbon dioxide were estimated for each alternative and compared to the total U.S. emissions of carbon dioxide in 2005 (EPA 2007d). These emissions ranged from 44 metric tons (49 tons) per year for the No Action Alternative to 5,400 metric tons (6,000 tons) per year for the Sitewide Removal Alternative, representing from 0.0000007 percent under the No Action Alternative to 0.00009 percent under the Sitewide Removal Alternative, of U.S. emissions in 2005. These emissions would make a small incremental contribution to cumulative impacts on global climate change.

The new U.S. Route 219 Freeway is included in the Transportation Improvement Program, which was found to conform to the State Implementation Plan. Therefore, the project will not interfere with the area's progress toward achieving the air quality goals of the State Implementation Plan (USDOT and NYSDOT 2003b).

As described in Section 4.5.3 of this chapter, the EPA National Priorities List sites (EPA 2007a, 2007b) and the State of New York cleanup sites (NYSDEC 2006c, 2008d) are distant to WNYNSC, and most of these sites are well into the control and cleanup process. Therefore, toxic pollutant emissions from these sites are not expected to substantially contribute to cumulative toxic air pollutant concentrations near WNYNSC. Cumulative impacts of radiological air pollutants are discussed in Section 4.5.13, Public Health and Safety, of this chapter.

Overall, air quality impacts from decommissioning activities at WNYNSC would be small, and would not contribute substantially to cumulative impacts in the region, except possibly for particulate matter.

Noise – Decommissioning activities for the three decommissioning alternatives would result in some increase in noise levels from construction and demolition equipment. If multiple pieces of equipment were operating at the same time, the noise levels at the nearest residences would be expected to be audible above the background sound levels in the area. Truck or rail traffic traveling to and from the area as part of decommissioning activities would also contribute to noise impacts.

Noise from these and other activities near the WNYNSC boundary would occur during daytime hours and could be a source of annoyance to nearby residents. During many of the closure activities, there would be no change in day/night average sound levels and noise impacts on the public outside of WNYNSC, except for noise attributable to construction employee vehicles and trucks hauling materials and waste.

Most reasonably foreseeable activities at WNYNSC would occur before decommissioning, would have lower noise levels (DOE 2006c), and would not contribute to cumulative noise impacts.

Short-term noise increases are expected due to construction of the new U.S. Route 219 Freeway. However, with construction activities likely taking place only during the day, the increased noise will likely not be perceived as severe. Mitigation measures such as source control, site control, time and activity constraints, and community awareness can be incorporated to reduce construction noise impacts (USDOT and NYSDOT 2003b).

Compared to existing conditions, noise levels due to traffic on the new U.S. Route 219 Freeway are expected to be greater in areas adjacent to the proposed freeway. It is estimated that 573 properties would be impacted by noise from the new freeway. A reduction in noise levels is expected adjacent to the existing U.S. Route 219 due to the expected diversion of traffic to the new freeway (USDOT and NYSDOT 2003b).

Overall, noise impacts from decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

4.5.10 Ecological Resources

Construction, operation, and demolition actions that are part of the decommissioning alternatives would occur primarily in previously disturbed areas and would result in localized short-term disruptions. Impacts of decommissioning actions would be minimized by controlling timing of the actions as well as the extent of the area disturbed at any one time.

Reasonably foreseeable actions at WNYNSC would occur primarily within the disturbed area. Because these actions would be conducted in the disturbed area, they would have minimal impact on ecological resources.

Construction of the new U.S. Route 219 Freeway would contribute to habitat fragmentation, a process whereby a large continuous area of habitat is both reduced in area and divided into two or more fragments. Even though roads can occupy only a small fraction of the land area, they contribute to fragmentation by dividing previously larger habitats into two or more smaller ones. The influence of habitat fragmentation can extend far beyond the immediate road boundaries. When completed, the new freeway would disturb 541 hectares (1,337 acres) of land along its 45-kilometer (28-mile) length. Based on the desire to avoid urban centers and significant agricultural parcels, approximately 306 hectares (756 acres) of forest communities will be disturbed by the new freeway. Although some relatively mature forest stands will be impacted by the project, for the most part, the forest stands to be traversed are already disturbed and fragmented.

The creation of the new U.S. Route 219 Freeway corridor through existing ecological communities will result in increased road kill. A number of options to minimize the frequency of road kill to various wildlife species will be considered during the final design phase of the project in consultation with wildlife resource agencies. A variety of wildlife crossings, including enlarged culverts, additional culverted crossings, modified span-type bridges, and enlarged medians, will be considered to maximize opportunities for safe wildlife crossings, to allow for greater connectivity of habitat, and to potentially reduce the risks of collisions with wildlife attempting to cross roadways (USDOT and NYSDOT 2003b). Projections of changes in animal mortality from vehicle collisions were not provided in the final EIS for the U.S. Route 219 Freeway.

Completion of the six wind energy projects planned for the ROI would result in the loss of birds and bats from collision with the rotating blades of the turbine. Studies have documented an average mortality rate of 2.3 birds and 3.4 bats per turbine per year (NWCC 2004). Projection of these rates to the 378 turbines planned for the ROI would result in the loss of approximately 870 birds and 1,300 bats each year.

Decommissioning activities at WNYNSC would directly impact a maximum of 2.8 hectares (7.0 acres) of wetlands under the Sitewide Removal Alternative (Section 4.1.6). Indirect impacts to other wetlands could occur due to sedimentation resulting from erosion of disturbed soils upslope from wetlands. Prior to the disturbance of any jurisdictional wetland, a Section 404 permit would be acquired from the U.S. Army Corps of Engineers. In the case of disturbance to a New York State Freshwater Wetland, a permit would be acquired from the Department of Environmental Conservation. Additionally, a mitigation plan would be developed with mitigation options ranging from the re-establishment of those areas impacted to the creation of new wetlands either on or off site. Best management practices, including erosion and sediment controls, would be implemented during all remediation work to prevent indirect impacts.

A total of 13.0 hectares (32.1 acres) of jurisdictional wetlands (the majority of which are small, isolated, low quality emergent wetlands) will be lost during construction of the U.S. Route 219 Freeway. Twenty-eight wetlands totaling 4.4 hectares (10.8 acres) will be impacted within the Cattaraugus Creek drainage basin. Additional wetlands will be created at a 2 to 1 ratio to mitigate these impacts (USDOT and NYSDOT 2003b).

Measurable impacts on plant and animal populations on or off WNYNSC are not expected as a result of the incremental increase in exposure to radionuclides or chemicals that would result from the decommissioning alternatives analyzed in this EIS. Additional deposition resulting from the alternatives analyzed in this EIS would not lead to levels of contaminants that would exceed the range of concentrations historically reported in the annual site environmental surveillance reports.

Overall, ecological impacts from decommissioning activities at WNYNSC would be localized to WNYNSC and would not contribute substantially to cumulative impacts in the region. The other activities in the region, particularly the construction of the U.S. Route 219 Freeway and the construction of wind turbines, would have much greater impact on the ecosystem as a result of habitat fragmentation, road kill, and bird/bat fatalities from turbine blades.

4.5.11 Cultural Resources

The majority of decommissioning activities on WNYNSC would occur within previously disturbed areas contained within or adjacent to developed areas. The likelihood that these areas contain cultural materials intact or in their original context is small. Standard measures to avoid or minimize the impacts on cultural materials discovered during site development are in place. Further, cultural resource surveys would be performed prior to construction or surface disturbance, and appropriate standard measures, such as avoidance or scientific documentation and Tribal consultation, would be implemented if resources are found.

Construction of the U.S. Route 219 Freeway will adversely affect a total of 12 properties eligible for listing on the National Register of Historic Places (USDOT and NYSDOT 2003b). Activities at WNYNSC are at some distance from these 12 properties and would not contribute to cumulative impacts.

Overall, cultural resources impacts from decommissioning activities at WNYNSC would be very small and localized to WNYNSC and would not contribute substantially to cumulative impacts in the region.

4.5.12 Socioeconomics

Employment – Direct employment at WNYNSC in support of decommissioning actions could reach 100 to 350 persons in the peak year of activities. Current employment would be reduced as ongoing waste management and decontamination, demolition, and removal activities are completed. Therefore, employment for existing site activities is not likely to be additive to the activities evaluated under the decommissioning alternatives for this EIS. Future employment for decommissioning activities could act to temporarily reduce the adverse effects of a reduction in baseline employment.

Construction of the U.S. Route 219 Freeway is estimated to result in 4,700 onsite temporary jobs, 11,800 indirect temporary jobs, and 8,700 induced temporary jobs in the ROI (USDOT and NYSDOT 2003b). This would overshadow the 290 to 350 direct jobs estimated for the alternatives considered in this EIS.

Overall, regional socioeconomic impacts from decommissioning activities at WNYNSC would be very small, of less significance than the ongoing construction of the U.S. Route 219 Freeway, and would not contribute substantially to cumulative impacts.

4.5.13 Public Health and Safety

The peak annual dose to individual members of the public and to the general population from decommissioning actions would be relatively small, as discussed in Section 4.1.9 of this chapter. The activities and therefore the doses and health effects from reasonably foreseeable activities at WNYNSC, including waste storage and disposal (DOE 2003e, DOE 2006b) and decontamination, demolition, and removal of lightly contaminated buildings (DOE 2006c), would be essentially complete before decommissioning activities would be initiated. Therefore, annual doses and health effects for existing site activities, waste storage and disposal, and decontamination, demolition, and removal of lightly contaminated buildings, are not additive to the annual dose and health effects for the decommissioning alternatives evaluated in this EIS.

Public exposure to hazardous chemicals is not projected for any of the decommissioning alternatives or for reasonably foreseeable activities at WNYNSC.

None of the other activities identified as occurring in the ROI is likely to add to the radiological exposure or be a source of chemical exposure for individuals and populations surrounding WNYNSC. Therefore, cumulative impacts are not expected.

4.5.14 Occupational Health and Safety

As discussed in Section 4.1.9 of this chapter, the annual average dose to the decommissioning worker would be less than 100 millirem per year, regardless of the EIS alternative selected. Reasonably foreseeable activities at WNYNSC, including waste storage and disposal (DOE 2006b) and decontamination, demolition, and removal of lightly contaminated buildings (DOE 2006c), would have been essentially completed before decommissioning is initiated. Therefore, the annual occupational exposures from these activities are not additive to the annual occupational exposure from the decommissioning alternatives. The ongoing storage of existing orphan waste would result in an estimated 0.6 person-rem per year, which would be a small addition to the annual occupational exposure for the decommissioning actions.

None of the other activities identified as occurring in the ROI would add to the occupational exposure for WNYNSC workers. Therefore, cumulative impacts are not expected.

4.5.15 Waste Management

Waste management requirements, including waste handling, transportation, and disposal could increase significantly for WNYNSC decommissioning. Waste management volumes would range up to a maximum of about 1.6 million cubic meters (56 million cubic feet) for the Sitewide Removal Alternative.

The disposition of waste generated by reasonably foreseeable activities at WNYNSC would be largely complete prior to the start of decommissioning activities. As noted in Chapter 3, Table 3–20, this waste is projected to include about 26,000 cubic meters (920,000 cubic feet) of nonhazardous construction/demolition debris, 2,000 cubic meters (71,000 cubic feet) of hazardous waste, 25,000 cubic meters (880,000 cubic feet) of low-level radioactive waste, and 750 cubic meters (26,000 cubic feet) of mixed low-level radioactive waste. In addition, 960 cubic meters (34,000 cubic feet) of contact-handled transuranic waste and 1,185 cubic meters (42,000 cubic feet) of remote-handled transuranic waste is projected through the end of fiscal year 2011. This estimated 2,100 cubic meters (74,000 cubic feet) of transuranic waste currently does not have a disposal path and is expected to be stored on site at the start of decommissioning. An insignificant quantity of additional transuranic waste would be generated if the Sitewide Close-In-Place Alternative is selected, but up to 1,000 cubic meters (35,000 cubic feet) would be generated if the Sitewide Removal Alternative or the Phased Decisionmaking Alternative is selected. Implementing the Sitewide Removal Alternative would generate 4,200 cubic meters (150,000 cubic feet) of Greater-Than-Class C waste that also does not have a current disposal path. Management of this orphan waste would produce 3.2 cubic meters (113 cubic feet) per year of additional waste (Chamberlain 2008).

Other activities in the region will not add to impacts to the WNYNSC waste management infrastructure.

4.5.16 Transportation

The collective dose, cumulative health effects, and traffic fatalities from approximately 130 years of radioactive material and waste transport across the United States are estimated in **Table 4–59**. One hundred-thirty years is approximately the period of time from the start of DOE nuclear materials operations in the 1940s to the end of the period of analysis for the Sitewide Removal Alternative in 2070. The total collective worker dose from all types of shipments (general transportation, historical DOE shipments, reasonably foreseeable actions, and EIS alternatives) was estimated to be up to 386,450 person-rem, which would result in 232 LCFs among the affected transportation workers. The total collective dose to the general public was estimated to be up to 350,806 person-rem, which would result in 210 excess LCFs among the affected general population. The total estimated traffic fatalities associated with accidents involving radioactive material and waste transports would be 125 to 155. The majority of the collective doses for workers and the general population are associated with the general transportation of radioactive material. These activities include shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level radioactive waste to commercial disposal facilities. The majority of the traffic fatalities are due to the general transportation of radioactive materials (28 fatalities) and reasonably foreseeable actions (94 fatalities).

Table 4–59 shows that the impacts of alternatives evaluated in this EIS are small compared with the overall transportation impacts associated with radioactive materials and waste shipments across the United States. The alternatives addressed in this EIS would result in the potential for 1 worker cancer death (LCF), no public cancer deaths (LCFs), and 7 traffic fatalities, and therefore would not contribute substantially to cumulative impacts. For perspective, it may be noted that several million traffic fatalities from all causes are expected nationwide during the period from 1943 to 2047 (DOE 2004b).

Freeway facilities with controlled access have much lower accident rates than either two-lane or four-lane highways with free access. Traffic safety will be improved both for users of the new U.S. Route 219 Freeway, and for local traffic on existing U.S. Route 219, where traffic volumes will be lower. Overall public safety will be improved by providing facilities best suited for all traffic types, local roads for local traffic, and high-speed freeways for heavy trucks and long-distance travelers, avoiding the natural conflicts when these traffic types mix (USDOT and NYSDOT 2003b). Therefore, adverse cumulative traffic fatalities with WNYNSC decommissioning activities are unlikely.

Table 4–59 Cumulative Impacts from Transportation of Radioactive Materials

Activity		Worker		General Population		Traffic Fatalities [a]
		Dose (person-rem)	LCF Risk	Dose (person-rem)	LCFs	
Past, Present, and Reasonably Foreseeable Future Actions						
General transportation, 1943 to 2073 (DOE 2008b)		350,000	210	300,000	180	28
Historical DOE shipments (from 1943) (DOE 2008b)		330	0.20	230	0.14	NR
Reasonably foreseeable actions (DOE 2008b)		28,000	16.8	49,000	29.4	94
High-level radioactive waste and spent nuclear fuel disposal at Yucca Mountain (DOE 2008b) [d]		5,900 (5.9)	3.5 (0.0035)	1,200 (0.96)	0.72 (0.00058)	2.8 (0.0020)
Subtotal Other Actions		384,230	231	350,430	210	125
Decommissioning and/or Long-Term Stewardship EIS Alternatives [b]	Sitewide Removal	2,220	1.33	376	0.22	30
	Sitewide Close-In-Place	51	0.03	12	0.0072	0.37
	Phased Decisionmaking (Phase 1)	403	0.24	71	0.043	4.0
	No Action	47	0.028	15	0.0090	0.06
Total [c]		384,277 to 386,450	231 to 232	350,442 to 350,806	210	125 to 155

LCF = latent cancer fatality; NA = not applicable; NR = not reported.
[a] Traffic fatalities associated with transporting radioactive materials and waste.
[b] Maximum transportation impact indicators from this chapter. The values were rounded where applicable.
[c] Total is a range that includes the minimum and maximum values from the alternatives addressed in this EIS. Total may not equal the sum of the contributions due to rounding.
[d] The values in parentheses are for high-level radioactive waste shipments only from the WVDP, assuming rail transport through the Caliente Corridor (DOE 2008b).
Note: LCFs were calculated using a conversion of 0.0006 LCF per person-rem (DOE 2002a).

4.5.17 Environmental Justice

As shown in Section 4.1.13 of this chapter, decommissioning activities at WNYNSC would not result in disproportionately high and adverse impacts on minority and low-income populations. The reasonably foreseeable actions at WNYNSC are not expected to have impacts on minority and low-income populations. Therefore, there would be essentially no cumulative environmental justice impacts.

4.6 Resource Commitments

This section describes the unavoidable adverse environmental impacts that could result from the implementation of the EIS alternatives, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources. Unavoidable adverse environmental impacts are impacts that would occur after implementation of all feasible mitigation measures. The relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity addresses issues associated with the condition and maintenance of existing environmental resources used to support the EIS alternatives and the utility of these resources after their use. Resources that would be irreversibly and irretrievably committed are those that cannot be recovered or recycled and those that are consumed or reduced to unrecoverable forms.

4.6.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are impacts that would occur after implementation of all feasible mitigation measures, including those incorporated into the design elements of EIS alternatives. Implementing the alternatives considered in this EIS would result in unavoidable adverse impacts on the human environment. A summary discussion of these impacts is included in this section; however, more detailed discussion on impacts for each resource area can be found in the appropriate subsections of Section 4.1 of this chapter.

Unavoidable adverse impacts would occur due to land disturbance. Some plants and small animals could be displaced during land clearing and excavation activities. Biological surveys indicate that construction of treatment and storage facilities at the WNYNSC is not expected to disturb sensitive plants or animals, or alter or destroy sensitive habitat. Although noise levels would be relatively low outside the immediate construction areas, the combination of noise and associated human activity would displace small numbers of animals surrounding the construction areas. New land disturbance would be greatest under the Sitewide Removal Alternative, particularly due to the extensive excavation activities associated with remediation of the Cesium Prong.

Geologic materials (i.e., gravel, sand, soil, etc.) would be required for new facility construction and backfilling during excavation. Some onsite geologic resources could be used to satisfy this demand and would represent an unavoidable adverse impact. Grading and revegetation of native plant species would restore the areas from which materials would be acquired.

Adverse impacts on subsurface soils and groundwater, and subsequently on nearby surface water bodies, would be unavoidable over the long term due to historic releases of contaminants and the maintenance of onsite disposal areas. The greatest impact to water resources would be experienced under the No Action Alternative, where the site could be assumed to degrade over time, leading to the eventual release of contaminants, and where construction of more robust control features over permanent disposal facilities would not be completed. All the decommissioning alternatives are designed to enhance the long-term performance of the site. The long-term performance assessment with projected impacts on various receptors is detailed in Section 4.1.10 of this chapter.

The Sitewide Removal Alternative would result in the fewest unavoidable adverse impacts due to radiological and hazardous chemical exposure from contaminant releases to groundwater or from erosion. This alternative would decontaminate the entire site to residual radiological levels that would result in a dose less than 25 millirem per year for any foreseeable onsite receptor. Because the land would be available for release for unrestricted use, except for an optional facility for orphan waste storage, the Sitewide Removal Alternative would not depend on institutional controls or monitoring and maintenance over the long term.

As discussed in Section 4.1.10.3.1 of this chapter, implementation of an alternative where waste would remain on site and institutional controls would be continued, would result in an estimated radiological dose to offsite receptors of less than 25 millirem per year. Exposure impacts from nonradiological hazardous chemicals would also be very low. The health risk for exposure to nonradiological chemicals would be dominated by radiological exposures.

Institutional controls are considered an important part of any alternative, and act to mitigate potential impacts. However, the unlikely loss of institutional controls would potentially lead to unmitigated erosion and/or intruders within site boundaries and would result in radiological dose impacts to humans. The unmitigated erosion case would lead to doses approaching or exceeding 500 millirem per year for some individual receptor scenarios. The population receptor scenarios analyzed for unmitigated erosion would result in doses comparable to annual background doses. Onsite intruder scenarios would result in much larger and potentially fatal doses to individual receptors under the No Action Alternative compared to results for the Sitewide Close-In-Place Alternative. Most of the intruder dose would be attributable to direct disturbance of the NDA and SDA. The Sitewide Close-In-Place Alternative would cover these burial grounds with multi-layered engineered barriers and, therefore, would limit direct contact and doses to intruders.

Unavoidable impacts on floodplains and wetlands would occur as the result of implementing any of the decommissioning alternatives. The Sitewide Removal Alternative would have the greatest impact on floodplains and wetlands. Floodplain impacts would occur in the short-term during Cesium Prong remediation work, removal of the North and South Reservoirs and dam, and streambed remediation along Erdman Brook and Franks Creek. These impacts to floodplains would not be permanent. Direct impacts to jurisdictional wetlands would occur as a result of Cesium Prong remediation work in the vicinity of WMA 3, 4, and 5, and along Quarry Creek. Other wetlands that would be impacted would be in the vicinity of the SDA during exhumation and in the vicinity of WMA 12 during closure of the dams and reservoirs.

Under the Sitewide Close-In Place Alternative, construction of engineered barriers over the SDA and NDA would encroach upon and permanently alter the 100-year floodplain. Furthermore, under the Sitewide Close-In-Place Alternative, construction of erosion control features in and around the facilities would impact floodplain performance and wetlands. Phase 1 of the Phased Decisionmaking Alternative would not adversely or directly impact floodplains or wetlands, although these resources could be adversely impacted depending on the scope of Phase 2 activities.

Construction activities undertaken for any of the decommissioning alternatives could have an indirect adverse impact on wetlands due to erosion and sedimentation from earthmoving activities. Most of the indirect impacts on wetlands could be mitigated as described in Chapter 6, Section 6.5, of this EIS.

Even with application of best management practices, some fugitive dust and noise generation, soil erosion, and increased vehicular traffic would be unavoidable during construction of treatment facilities and removal of buried waste material and contaminated soil. These impacts would be relatively minor and temporary in nature.

Unavoidable adverse impacts on air quality would occur due to emission of various chemical and radiological constituents during treatment facility construction and operation. Under all alternatives, nonradiological emissions are not expected to exceed NAAQS. Chemical and radiological emissions would also not exceed NESHAP.

Retrieval and treatment of waste under normal operating conditions would also result in unavoidable radiation exposure to workers and the general public. Workers would have the highest levels of exposure, however, doses would be administratively controlled. Incremental annual dose contributions to the offsite MEI, general population, and workers are discussed in Section 4.1.9 of this chapter. These doses are not expected to exceed standards or administrative control limits.

Generation of some waste products would be unavoidable, including transuranic waste, low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste. Wastes generated during construction and operations would be collected, stored, and shipped for suitable treatment, recycling, or disposal in accordance with applicable Federal and State regulations, as described in the waste management sections of this chapter. Activities would be conducted and operations optimized to generate the smallest amount of waste practical. The Sitewide Removal Alternative has the highest potential for generating waste for which a final disposition pathway has not been identified, and thus, may require indefinite storage on site.

4.6.2 Irreversible and Irretrievable Commitments of Resources

This section describes the major irreversible and irretrievable commitments of resources that have been identified under each alternative considered in this EIS. A commitment of resources is irreversible when primary or secondary impacts limit future options for a resource. An irretrievable commitment refers to the use or consumption of resources neither renewable nor recoverable for future use. In general, the commitment of capital, land, energy, labor, and materials during implementation of the alternatives would be irreversible or irretrievable. Implementation of any of the alternatives considered in this EIS, including the No Action Alternative, would entail the irreversible and irretrievable commitment of land, labor, construction materials (e.g., steel, and concrete) and geologic resources, energy and fossil fuels, and water. **Table 4–60** presents the major resource requirements that would be irreversibly or irretrievably consumed under each alternative. Under Waste Containers, roll-on/roll-off and Sealand containers are not included as an irretrievable resource because these containers are reused and not buried with the waste. However, it is assumed that these containers would be refurbished approximately every 20 loads. The consumption of resources in the table has been divided into decommissioning and monitoring and maintenance categories, with the exception of Phase 1 of the Phased Decisionmaking Alternative. In the case of Phase 1, resource commitments include anything consumed within the first 30 years and does not distinguish between decommissioning or monitoring and maintenance activities. For all other alternatives, decommissioning activities are well defined and the consumption of resources is finite. Resources associated with decommissioning activities would generally occur in the short term and are presented as totals. Resources associated with monitoring and maintenance activities are cumulative. Because these resources would generally occur for an indefinite period of time, they are presented on an annual basis. For the Sitewide Close-In-Place Alternative, monitoring and maintenance resources would be expended as part of a long-term stewardship program.

4.6.2.1 Sitewide Removal Alternative

This alternative would consume the most labor, utilities, waste containers, and in some cases, the most material resources; however, after implementing this alternative, no additional monitoring and maintenance resources would be consumed on an annual basis because the entire site would be available for release for unrestricted use. However, commensurate with the aggressive nature of the cleanup, a large amount of waste would be generated, potentially involving orphan waste. Potential orphan waste would not have an identified disposal pathway, and management of this waste on site would require the annual consumption of resources until final disposition is determined. Unrestricted release of land dedicated to the long-term storage of orphan waste would also be delayed. This would involve the continued use of the Container Management Facility occupying approximately 24.3 hectares (60 acres) of land. The estimated monitoring and maintenance resources for long-term storage of orphan waste are displayed in parentheses in Table 4–60.

4.6.2.2 Sitewide Close-In-Place Alternative

This alternative would consume the most material resources associated with the backfilling and/or grouting of void spaces and the construction of engineered surface barriers. Most of the decommissioning resources would be committed within the first 7 years; however, those associated with the operation and demolition of the Interim Storage Facility would continue for 26 more years. Monitoring and maintenance resource commitments would begin after 7 years and would continue indefinitely as part of a long-term stewardship program. Monitoring and maintenance activities would include annual maintenance of erosion control features, environmental monitoring, maintenance of the engineered surface barriers, and as needed replacement of the North Plateau Groundwater Plume permeable reactive barrier about every 20 years. The land areas retained for management of disposal areas (e.g., North Plateau, SDA, and NDA) would be considered a permanent commitment of land resources.

The potential does exist for the generation of orphan waste similar to the Sitewide Removal Alternative. Unlike the Sitewide Removal Alternative, there would be suitable areas of the site retained under management to accommodate the long-term storage of this waste, and the quantities and risk of potential orphan waste would be significantly less. Therefore, no additional commitment of resources beyond those monitoring and maintenance resources already assumed are expected to be necessary for the onsite storage of orphan waste under the Sitewide Close-In-Place Alternative.

Table 4–60 Irreversible and Irretrievable Commitment of Resources

Resource	*Sitewide Removal Alternative*		*Sitewide Close-In-Place Alternative*		*Phased Decisionmaking Alternative*			*No Action Alternative*	
						Total [e]			
	Decommissioning	*M&M (annual)* [a]	*Decommissioning* [b]	*M&M (annual)* [c]	*Phase 1* [d]	*Decommissioning*	*M&M (annual)*	*Decommissioning* [f]	*M&M (annual)* [f, g]
Land (hectares)	0 (24)		234		659	0 - 234		659	
Labor (FTEs)	16,500	0 (20)	2,130	24	3,040	3,530 – 16,500	0 - 24	0	75
Materials									
Concrete (cubic meters)	168,000	0	5,900	0	3,960	5,900 - 168,000	0	0	0
Concrete Block (square meters)	5,980	0	0	0	0	0 - 5,980	0	0	0
Cement (cubic meters)	670	0	8,830	0	250	670 - 8,830	0	0	0
Grout (cubic meters)	50	0	56,400	0	570	50 - 56,400	0	0	0
Soil (cubic meters)	1,258,000	0	877,000	18,300	92,500	877,000 - 1,258,000	0 - 18,300	0	0
Sand, Gravel, and Stone (cubic meters)	34,800	0	765,200	10,500	1,150	34,800 - 765,200	0 - 10,500	0	370
Clay (cubic meters)	71,200	0	134,000	1,740	68,000	71,200 - 134,000	0 - 1,740	0	0
Zeolite (cubic meters)	0	0	1,680	84	1,680	0 - 1,680	0 - 84	0	84
Bentonite (cubic meters)	950	0	27,400	0	950	950 - 27,400	0	0	0
Asphalt (metric tons)	8	0	0	0	0	0 - 8	0	0	2
Roofing Felt (square meters)	0	0	0	0	0	0	0	0	940
Steel (metric tons)	290,000	0	530	0	1,760	530 - 290,000	0	0	0
Sheet and Helical Piling (metric tons)	15,400	0	0	0	450	0 - 15,400	0	0	0
HDPE Sheeting (square meters)	11,400	0	107,000	0	129,000	11,400 - 107,000	0	0	0
Geomembrane (square meters)	63,200	0	255,000	0	0	63,200 - 255,000	0	0	4,090
Fabric (square meters)	3,140	0	1,780	0	0	1,780 - 3,140	0	0	0
Geotextile (square meters)	13,600	0	191,000	0	0	13,600 - 191,000	0	0	0
Slurry Materials (liters)	959,000	0	0	0	0	0 - 959,000	0	0	0

Resource	*Sitewide Removal Alternative*		*Sitewide Close-In-Place Alternative*		*Phased Decisionmaking Alternative*			*No Action Alternative*	
						Total [e]			
	Decommissioning	*M&M (annual)* [a]	*Decommissioning* [b]	*M&M (annual)* [c]	*Phase 1* [d]	*Decommissioning*	*M&M (annual)*	*Decommissioning* [f]	*M&M (annual)* [f, g]
Utilities									
Electricity (megawatt-hours)	738,000	0 (2,270)	99,400	980	111,000	99,400 - 738,000	0 - 980	0	1,260
Natural Gas (cubic meters)	124,232,000	0 (361,000)	15,824,000	156,000	17,747,000	15,824,000 - 124,232,000	0 - 156,000	0	195,000
Diesel Fuel (liters)	31,625,000	0 (38,300)	21,272,000	183,000	9,460,000	21,272,000 - 31,625,000	0 - 183,000	0	29,000
Gasoline (liters)	9,769,000	0 (0)	2,639,000	35,800	775,000	2,639,000 - 9,769,000	0 - 35,000	0	9,600
Potable Water (liters)	687,455,000	0 (815,000)	88,860,000	1,069,000	70,022,000	88,860,000 - 687,455,000	0 - 1,069,000	0	3,136,000
Raw Water (liters)	3,383,734,000	0 (1,037,000)	384,410,000	2,635,000	355,141,000	384,410,000 – 3,383,734,000	0 - 2,635,000	0	13,829,000
Waste Containers [h]									
Lift Liners	187,000	0	1,680	14	21,100	1,680 - 187,000	0 - 14	0	1
55-gallon drums	29,700	0 (15)	860	0	5,770	860 - 29,700	0	0	140
B-25 Boxes	42,400	0	1,640	3	7,760	1,640 - 42,400	0 - 3	0	120
High Integrity Containers	1,090	0	0	0	220	0 - 1,090	0	0	0

FTE = full-time equivalent; M&M = monitoring and maintenance.

[a] The site would be released for unrestricted use and no additional resources would be consumed. Parenthetical values represent the annual resources that would be required for storage of orphan waste.

[b] Includes the commitment of resources for operations and demolition of the Interim Storage Facility.

[c] As part of a long-term stewardship program, annual monitoring and maintenance commitments would include North Plateau Groundwater Plume permeable reactive barrier replacement every 20 years (annualized) and maintenance of erosion control features.

[d] Includes all resource commitments for Phase 1 activities in the first 30 years.

[e] Phase 2 of the Phased Decisionmaking Alternative would involve the additional consumption of resources and potentially the unrestricted release of additional land areas. It is expected that the additional consumption of resources during Phase 2 would be between the Sitewide Removal and Sitewide Close-In-Place Alternatives, depending on the combination of activities selected for Phase 2, minus some of the resources expended to achieve decommissioning in Phase 1.

[f] No decommissioning activities would take place beyond the starting point of the EIS. M&M resources would be consumed on an annual basis indefinitely.

[g] Annual monitoring and maintenance commitments include roof replacements and SDA and NDA cap replacements every 25 years (annualized) as well as replacement of the permeable treatment wall every 20 years (annualized).

[h] The highest demand for one-time use waste containers was used, depending on the disposal option (DOE/Commercial or Commercial). Roll-on/roll-off and Sealand containers are reusable and are not buried with waste as one-time use containers, therefore, these are not considered an irretrievable resource.

Note: To convert hectares to acres, multiply by 2.471; cubic meters to cubic yards, multiply by 1.3079; square meters to square yards, multiply by 1.196; metric tons to tons, multiply by 1.1023; liters to gallons, multiply by 0.26418. One FTE = 2,080 worker hours per year.

Sources: WSMS 2008a, 2008b, 2008c, 2008d.

4.6.2.3 Phased Decisionmaking Alternative

This alternative addresses the decommissioning of some aspects of the site and defers other aspects until a later date. For this alternative, the commitment of resources under Phase 1 represents all activities, studies, and tests that would be implemented within the first 30 years, at which time Phase 2 activities will have been defined. Because many decommissioning activities would be deferred, an unknown quantity of resources would be committed in the future after Phase 2 activities have been evaluated and determined. The exact quantity of resources that would be consumed during Phase 2 is dependent on the combination of decommissioning activities that would be implemented; however, it is expected that the consumption of resources for the entire alternative would be between those estimates for the Sitewide Close-In-Place and Sitewide Removal Alternatives, minus some of the resources expended to achieve a portion of the decommissioning in Phase 1 (e.g., demolition of the Main Plant Process Building).

4.6.2.4 No Action Alternative

This alternative entails no decommissioning activities to be implemented beyond the starting point of this EIS; therefore, there are no commitments of resources for decontamination and decommissioning activities. However, this alternative does consume the most labor and utilities on an annual basis for continuing monitoring and maintenance activities. This consumption of resources on an annual basis would continue indefinitely. The monitoring and maintenance commitment of resources includes replacement of facility roofs and SDA and NDA caps about every 25 years, replacement of the permeable treatment wall about every 20 years, and the maintenance of access roads on site. The annual consumption of resources would likely increase over time, because the effort to maintain the site and its buildings in a similar state would also become more difficult with the passage of time and the deterioration of structures.

4.6.3 Relationship Between Short-term Use of the Environment and Long-term Productivity

Pursuant to NEPA regulations (40 CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. "Short-term" for purposes of analysis in this section of the EIS is the active project phase under each alternative during which the majority of construction, operations, and decommissioning activities would take place. "Long-term" is defined in this section of the EIS as the timeframe that extends beyond conclusion of the short term for each alternative. For purposes of human health impact analysis, "long-term" is defined differently in Section 4.1.10 of this chapter. Short-term and long-term uses of the environment in the broader context include elements of unavoidable adverse impacts and an irreversible and irretrievable commitment of resources in order to enhance the long-term productivity of the human environment. Unavoidable adverse environmental impacts are discussed in Section 4.6.1. The irreversible and irretrievable commitment of resources is discussed in Section 4.6.2.

The objective of any Proposed Action would be to demonstrate and implement the alternative that, on balance, would result in the least overall adverse impact on the environment. For any EIS alternative to be considered favorable, an increase in worker and public exposure under controlled circumstances (i.e., facility decommissioning) in the short term would lead to a decrease in exposure to the unprotected public and environment over the long-term. The selection of an alternative would, in part, need to consider the balance of short-term impacts against long-term benefits as demonstrated and discussed throughout Section 4.1 of this chapter. Also, the consumption of resources in the short term could lead to the unrestricted release of certain portions of the site.

Regardless of location, air emissions associated with decommissioning actions would introduce small amounts of radiological and nonradiological constituents to the atmosphere around WNYNSC. Over time, these emissions would result in additional loading and exposure, but would not impact compliance with air quality or radiation exposure standards at WNYNSC. There would be no significant residual environmental effects on long-term environmental viability.

Under certain alternatives, and in addition to short-term use of the environment, the emplacement of engineered surface barriers over portions of the North Plateau and/or permanent waste disposal sites would be considered a long-term use of the environment, and thus, a decrease in the long-term productivity for these locations. In other parts of the site, buildings and equipment could be decontaminated and demolished and the WNYNSC restored to either green- or brownfield sites, ultimately returning these areas to productive use.

While emplacement of engineered barriers would lead to a decrease in long-term productivity for small portions of the site where permanent burial grounds are located, it would lead to increased protection of groundwater resources over the long term and a reduced exposure risk to individual and population receptors, especially when evaluating the onsite intruder scenarios.

Adverse impacts to wetlands and floodplains would generally increase with the aggressive nature of each alternative in remediating the site and the associated increase in disturbance of land areas.

Most disturbed wetlands could have an additional adverse impact on local ecosystems; however, over the very long term, these ecosystems would be expected to recover, especially with the implementation of restoration and mitigation measures. The emplacement of engineered barriers would have a relatively small, but permanent, impact on floodplains.

Implementation of any of the alternatives would result in continued employment, expenditures, and tax revenues being generated, which, in turn, would directly benefit the local, regional, and State economies over the short term. Local governments investing project-generated tax revenues into infrastructure and other required services could facilitate long-term economic productivity.

The quantity of short-term resources needed to implement any of the alternatives analyzed in this EIS would not affect the long-term productivity in the region.

4.6.3.1 Sitewide Removal Alternative

The short-term duration of this alternative would take approximately 64 years to complete, and represents the longest active phase of the alternatives considered in this EIS. This alternative would have the most significant short-term impacts. Large areas of land would be disturbed, including previously undeveloped areas for excavation and remediation of the Cesium Prong. Significant volumes of waste would be generated and would require offsite disposal. Commensurate with the exhumation and removal of contamination, this alternative would result in the highest exposure potential for onsite workers and impacts to air quality. In contrast, the enhancement of long-term productivity would be the greatest, because the entire site would be eventually released for unrestricted use. However, shipment of waste to offsite disposal facilities could reduce the long-term productivity for these locations. With the large areas of land that would be disturbed under the Sitewide Removal Alternative, the greatest impact to wetlands would occur under this alternative as compared to the other alternatives analyzed. These impacts would offset some of the enhancements to long-term productivity of the site gained by achieving unrestricted release criteria.

4.6.3.2 Sitewide Close-In-Place Alternative

The short term of this alternative would involve approximately 7 years of significant onsite decommissioning activities, followed by 26 years of waste storage pending transportation to a disposal facility. As compared to the Sitewide Removal Alternative, the eventual decay of the Cesium Prong would lead to reduction of buffer zone boundaries and the unrestricted release of additional land, without the short-term impacts to the environment that would result from excavation and or operation of wastewater treatment systems. Where engineered surface barriers would be installed, this alternative would remove portions of the site from long-term productive use. As discussed in Section 4.1.10.3 of this chapter, when compared to the No Action Alternative, the predicted levels of radiological exposure over the long term to both onsite and offsite receptor scenarios would be significantly reduced, assuming indefinite continuance of institutional controls for the No Action Alternative. The reduction in predicted exposures would be achieved through construction of engineered barriers over waste burial sites and facilities that would be closed in place, and the construction of erosion control features that would protect these areas. However, the emplacement of engineered barriers and construction of erosion control features would permanently alter some floodplains. Some wetland areas would be adversely impacted, although to a less degree than that under the Sitewide Removal Alternative.

4.6.3.3 Phased Decisionmaking Alternative

The Phased Decisionmaking Alternative pursues selected decommissioning actions, while deferring other decisions until more effective solutions can be analyzed. Phase 1 of this alternative would involve decommissioning activities in the first 8 years, followed by up to 22 years of onsite waste storage, studies, tests, and ongoing monitoring and maintenance of the areas of the site that have been deferred to Phase 2 decommissioning actions. Phase 2 decommissioning activities would involve additional short-term impacts. The overall enhancement to the long-term productivity of the environment would remain unknown until Phase 2 activities had been determined; however, Phase 1 activities would serve to preserve the ability to maximize this enhancement by stabilizing and/or removing contaminated media from the site premises. Phase 1 activities analyzed under the Phased Decisionmaking Alternative would not adversely impact any wetlands or floodplains. The continued maintenance of some facilities, while decontaminating and decommissioning others, would result in some short-term impacts. The precise long-term impacts to human health and the environment cannot be determined for Phase 2 until the scope has been fully defined; however, the long-term impacts would be expected to be enveloped by the Sitewide Close-In-Place and Sitewide Removal Alternatives.

4.6.3.4 No Action Alternative

Under the No Action Alternative, environmental resources would continue to be committed to operations at WNYNSC on an annual basis. This commitment would serve to maintain existing environmental conditions with little or no enhancement of the long-term productivity of the environment. With the passage of time and the release of contaminants from onsite sources, the extent to which future remedial action would enhance the long-term productivity of the site would decrease. Under exposure scenarios involving onsite intruders, as discussed in Sections 4.1.10.3.2.1 and 4.1.10.3.2.2 of this chapter, significant, and possibly fatal, radiological exposures could occur to humans. Floodplains and wetlands would not be impacted, because no decontamination or decommissioning actions could be taken.