Chapter 4
Environmental Consequences

Chapter 4 describes the impacts that could result from implementing each of the three mercury management alternatives described in Chapter 2 on the affected environment described in Chapter 3. In general, the analyses show that the mercury management alternatives are predicted to have negligible to minor environmental and socioeconomic impacts. The human health and ecological risks would be negligible for all mercury management alternatives during normal operations. Risks from accidents would be moderate for all alternatives except No Action, which would have low risk. Transportation risks are highest for the Sales Alternatives.

Cumulative impacts on air quality; waste management; human health risks; transportation infrastructure; and employment, infrastructure, and land use were also evaluated. The contributions from mercury management activities to cumulative impacts were found to be negligible to minor. Similarly, cumulative impacts on regional and global issues including mercury concentrations and human health risk, transportation, ozone depletion and global warming, and biodiversity were also examined: negligible contributions to cumulative impacts were found.

4.1 INTRODUCTION

This chapter describes the environmental impacts that would be expected to occur over the next 40 years if any of the alternatives considered in this *Mercury Management Environmental Impact Statement* (MM EIS) were implemented. Environmental impacts are described in terms of the various aspects of the affected environment that would be expected to change over time. Environmental impacts could include direct physical disturbance of resources, consumption of resources, or degradation of resources caused by effluents and emissions. Impacts may be adverse (e.g., increased emissions of toxic materials) or beneficial (e.g., reduced hazardous waste generation). Impact analyses were performed for all disciplines where the potential exists for effects on the environment as listed below:

- Meteorology, Air Quality, and Noise
- Waste Management
- Socioeconomics
- Human Health and Ecological Risk from Normal Operations
- Human Health and Ecological Risk from Facility Accidents
- Transportation
- Geology and Soils
- Water Resources
- Ecological Resources
- Cultural Resources
- Land Use and Visual Resources
- Infrastructure
- Environmental Justice

> The term **"impact,"** when used in this MM EIS, refers to adverse, long-term impacts, unless otherwise stated.

Impacts are typically described in terms of intensity and duration. A set of standardize impacts terminology was developed for use in this MM EIS as presented in Table 4.1–1. This table describes the terms used for all impacts exclusive of human health and ecological risk. Beneficial impacts are those that would improve current conditions, while adverse impacts would degrade current conditions. Intensities are categorized as minor, moderate or major, with durations classified as short-term (less than or equal to 5 years) or long-term.

Table 4.1–1. Impact Categories and Definitions

Impact Category		Definition
Beneficial Impacts	Major	An action that would greatly improve current conditions
	Moderate	An action that would moderately improve current conditions
	Minor	An action that would slightly improve current conditions
Negligible or No Impact		An action that would neither improve nor degrade current conditions
Adverse Impacts	Minor	An action that would slightly degrade current conditions
	Moderate	An action that would moderately degrade current conditions
	Major	An action that would greatly degrade current conditions

Note: Impacts may also be categorized as short-term (less than or equal to 5 years) or long-term.

The human health and ecological risks of the alternatives are analyzed in the *Draft Human Health and Ecological Risk Assessment Report for the Mercury Management EIS (Draft Risk Assessment Report)* (DLA 2003). This report uses standard risk assessment methodology to evaluate the potential risks from both normal operation and postulated accidents. This is accomplished by defining a set of exposure scenarios, and estimating the frequency of occurrence and potential consequences for each scenario. Risk is expressed as a function of the frequency of occurrence of the event and the magnitude of the consequences. The assessment of frequencies of occurrence is generally based on historical rate statistics from industry, or lacking those, based on professional judgment. For analytical purposes, frequency is separated into the categories shown in Table 4.1–2.

Table 4.1–2. Frequency Categories

Frequency Category	Estimated Annual Frequency of Occurrence	Description
High	Greater than or equal to once in a hundred years	Incidents that may occur several times during the lifetime of the facility. (Incidents that commonly occur.) Accidents of this frequency range are evaluated further.
Moderate	Less than once in a hundred years to once in ten thousand years	Accidents that are not anticipated to occur during the lifetime of the facility. Natural phenomena of this probability class include: design basis earthquake, 100-yr flood, maximum wind gust, etc. Accidents of this frequency range are evaluated further.
Low	Less than once in ten thousand years to once in a million years	Accidents that will probably not occur during the life cycle of the facility. This class includes most design basis accidents. Although unlikely, accidents of this frequency range are evaluated further.
Negligible	Less than once in a million years	Accidents that are not credible and are not evaluated further.

To assess consequences, the source term, or amount of mercury available for release, is defined. For air releases, factors such as the rate at which mercury vapor is released to the atmosphere, the height of the release, or the heat content of the release are used to calculate the atmospheric dispersion of mercury transported downwind. The predicted airborne concentrations that could be encountered by maximally exposed workers and members of the public are then estimated. A dispersion model is used to predict how much mercury is deposited on the ground or in a body of water. These concentrations can be used to calculate the magnitude of potential health effects for the most exposed individual and the magnitude of adverse consequences for exposed plants and animals.

Consequences are expressed as the ratio of an exposure to an exposure-based benchmark. Benchmarks are generally established by scientific or professional organizations expert in human health or ecological effects. The benchmarks used in this analysis are risk-based and are protective of sensitive populations.

Exposures are classified as short-term (acute) or long-term (chronic) depending on the duration of the exposure. EPA defines acute exposures as those lasting up to or less than 24 hours, while exposures lasting a significant portion of a lifetime are defined as chronic. In some cases, airborne releases of mercury can result in dry (i.e., particulate) or wet (i.e., due to rainfall) deposition to soil, which can result in long-term (chronic) exposures to mercury in the soil.

The ecological risk assessment considers chronic exposures to a number of plants and animals: plants, soil invertebrates, the short-tailed shrew, the American robin, the red-tailed hawk, the great blue heron, aquatic biota, and sediment-dwelling (i.e., benthic) biota. These species or their habitats may not be present for all the evaluated sites, or at all locations along a transportation corridor, but are representative of the species that could be present.

Risk can be determined by making use of the simple matrix presented in Figure 4.1–1. This figure has been adapted from a matrix that originally appeared in EPA's *Technical Guidance for Hazards Analysis* (EPA 1987). There are three categories of risk in this matrix: high, moderate, and low. Negligible risk is implicitly included, but falls outside the matrix: if either the frequency or severity of the consequences is negligible, the risk is determined to be correspondingly negligible. To determine the risk of a given accident scenario using this matrix, identify both the frequency of occurrence and the severity of consequences. The block where the two intersect identifies the risk. As an example, Figure 4.1–1 indicates that a scenario with a low frequency of occurrence and a high health effect consequence results in a moderate risk.

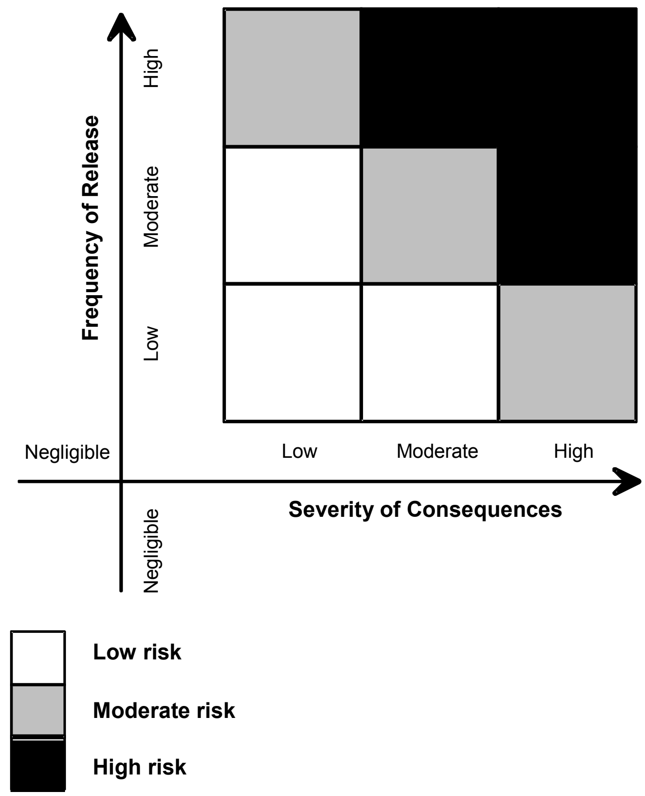
Table 4.1–3 is based on Figure 4.1–1 and provides information similar to Table 4.1–1. Intensities are categorized as low, moderate, or high, with durations classified as acute or chronic.

Table 4.1–3. Human Health and Ecological Risk Categories and Definitions

Risk Category		Definition
Reduced Risk	High	An action that would greatly reduce risk
	Moderate	An action that would moderately reduce risk
	Low	An action that would slightly reduce risk
Negligible or No Increase in Risk		An action that would neither reduce nor increase risk
Increased Risk	Low	An action that would slightly increase risk
	Moderate	An action that would moderately increase risk
	High	An action that would greatly increase risk

Note: Risks may also be categorized as acute (less than or equal to 24 hours) or chronic.

Source: Based on the risk matrix presented in the *Human Health and Ecological Risk Assessment Report for the Mercury Management EIS* (DLA 2003).



Source: EPA 1987.

Figure 4.1–1. Risk (Frequency and Consequence) Ranking Matrix

The environmental consequences of alternatives for mercury management were generally estimated by comparing facility characteristics and requirements from Chapter 2 (Mercury Management Alternatives) and Appendix C (Facility and Activity Data) with affected environment information from Chapter 3. The analyses were performed in accordance with the impact assessment methods described in Appendix E.

The assessments in this MM EIS have generally been performed so that the estimated magnitude and intensity of impacts are unlikely to be exceeded. For routine operations, estimates from actual or similar operations provide a reasonable basis for predictions of impacts. For accidents, there is more uncertainty because the impacts are often based on events that have not occurred. In this MM EIS, hypothetical accidents were selected that would produce impacts as severe or more severe than any reasonably foreseeable accidents.

More detailed descriptions of the development of the impacts for environmental justice are presented in Appendix G, (Environmental Justice). The *Draft Risk Assessment Report* contains detailed information on the human health and ecological risk assessments (DLA 2003).

As shown in Table 4.1–4, Comparison of the Impacts and Costs of Mercury Management Alternatives, the environmental and socioeconomic impacts of alternatives for mercury management are generally negligible to minor for all alternatives. Key resource areas include air quality and noise, waste management, socioeconomics (employment), human health and ecological risk under normal operating and accident conditions, transportation risk, water resources, land use, infrastructure, and environmental justice. Other resources, including geology and soils, ecological resources, cultural resources, and visual resources, are not presented here because these resources are essentially unaffected by the mercury management alternatives. These resources are largely unaffected because the alternatives do not involve building construction or land disturbance.

Table 4.1–4. Comparison of the Impacts and Costs of Mercury Management Alternatives

		Alternatives			
				Sales	
	Topics	**No Action (1)[a]**	**Consolidated Storage (2A–2F)[b]**	**At Maximum Allowable Market Rate (3A)[c]**	**To Reduce Mercury Mining (3B)[d]**
Environmental and Socioeconomic Impacts	Meteorology, Air Quality, and Noise	Negligible	Minor short term	Minor	Minor short term
	Waste Management	Negligible short term	Minor short term	Negligible short term	Negligible short term
	Socioeconomics	Negligible	Negligible	Negligible	Negligible short term
	Water Resources	Negligible	Negligible to minor	Negligible	Negligible short term
	Land Use	No	No	No	Negligible short term
	Infrastructure	Negligible	Negligible to minor	Negligible	Negligible short term
	Environmental Justice	No	No	No	No
Human Health Risks/Ecological Risks	Risks from Normal Operations	Negligible/ Negligible	Negligible/ Negligible	Negligible/ Negligible	Negligible short-term/Negligibl e short term
	Risks from Accidents	Low/ Negligible	Moderate/ Moderate	Moderate/ Moderate	Moderate/ Moderate
	Transportation Risk	No/No	Low/Moderate	Moderate/High	Moderate/High
Costs	Present Value	$30 million	$21 to 62 million	$(11) to 7 million	$(25) to (7) million

[a] This column indicates the potential impacts that would result at the existing storage locations.

[b] This column indicates the potential impacts that would result at the consolidation locations and along the transportation routes. This alternative would also result in minor beneficial impacts and low reduced risk at existing storage locations after the mercury is removed. This is DNSC's preferred alternative.

[c] This column indicates the potential impacts that would result at the existing storage locations and along the transportation routes. Minor beneficial impacts and low reduced risk would also occur at existing storage locations after the mercury is removed. This alternative would also result in negligible or no additional impacts and risks at the mercury buyer's and user's locations.

[d] This column indicates the potential impacts that would result at the existing storage locations and along the transportation routes. Minor beneficial impacts and low reduced risk would also occur at existing storage locations after the mercury is removed. This alternative would also result in moderate beneficial long-term impacts and moderate reduced risk from reduced mercury mining and refining.

Note: Values in parenthesis () are revenues rather than costs. Present value is the value today of a future payment, or stream of payments, discounted at an appropriate rate.

The difference in the impacts among the alternatives is largely due to the number of sites affected and the duration of the impacts. The No Action Alternative would affect the four existing storage locations with largely long duration (40 years) negligible impacts. Because the No Action Alternative would not allow the Defense National Stockpile Center (DNSC) depots to close, it is incompatible with DNSC's long-term closure strategy. The Consolidated Storage Alternative would affect the one consolidation location with largely long duration (40 years) impacts. In addition to negligible to minor impacts on the environment at the location where the mercury is consolidated, there would also be minor beneficial impacts at the existing storage locations after the mercury is removed. The Sales at the Maximum Allowable Market Rate Alternative would primarily affect the four existing storage locations with long duration (up to 26 years) negligible to minor impacts (see Appendix C, Table C–3). Sales at the Maximum Allowable Market Rate would also result in negligible or no impacts at the mercury buyer's and user's locations. The Sales to Reduce Mercury Mining Alternative would largely affect the four existing storage locations with short duration (up to 3 months) negligible to minor impacts. Sales to Reduce Mercury Mining would also result in moderate beneficial long-term impacts from reduced mercury mining and refining. Under the Sales Alternatives, minor beneficial impacts would also occur at the existing storage locations after the mercury is removed.

As shown in Table 4.1–4, the human health and ecological risks of alternatives for mercury management are within the normal ranges to be expected for these types of activities. The human health risks would be negligible for all mercury management alternatives during normal operations. Human health risks from facility accidents would range from low for the No Action Alternative to moderate for the Consolidated Storage and Sales Alternatives. Human health risks from transportation accidents would range from no additional risk for the No Action Alternative to moderate risk for both Sales Alternatives.

The ecological risks would be negligible for all mercury management alternatives during normal operations. Ecological risks from facility accidents would range from negligible for the No Action Alternative to moderate for the Consolidated Storage and Sales Alternatives. Ecological risks from transportation accidents would range from no additional risk for the No Action Alternative to high ecological risk for both Sales Alternatives. The high ecological risk for both Sales Alternatives is a result of the longer transportation distances for the truck transport segments associated with shipping mercury to overseas buyers. See Section 4.4.6 for more information.

The Consolidated Storage and Sale Alternatives would result in low reduced human health risk at the existing storage locations after the mercury is removed. The Sales to Reduce Mercury Mining Alternative is estimated to result in moderate reduced human health and ecological risk from reduced mercury mining and refining.

Costs would range from $62 million for consolidated storage at the Hawthorne Army Depot, PEZ Lake Development, or Utah Industrial Depot to revenues of $25 million for the Sales to Reduce Mercury Mining Alternative. Cost for consolidated storage are least expensive at the New Haven and Warren depots, ranging from $21 to $22 million.

4.2 ALTERNATIVE 1: NO ACTION–CONTINUED STORAGE AT CURRENT LOCATIONS

Under the No Action Alternative, the inventory of mercury would continue to be stored at the current locations, with surveillance and corrective action as necessary to maintain safe storage. The environmental impacts expected from the No Action Alternative are those associated with maintaining the status quo. The impacts from the No Action Alternative are discussed first to provide a basis of comparison for the impacts expected from the other alternatives.

4.2.1 New Haven Depot

4.2.1.1 Meteorology, Air Quality, and Noise

Meteorological events such as heavy snow, tornadoes, high winds, and lightning can result in damage to buildings such as the mercury storage warehouses. The frequency and consequence of such events were considered in selecting the accident events evaluated in Section 4.2.1.5.

Impacts on air quality and noise are anticipated to be negligible at the New Haven Depot under the No Action Alternative.

The primary sources of criteria pollutants at the New Haven Depot are natural gas boilers and a forced-air heating system, diesel fire pump, and material-handling equipment (forklift and sweeper). No active air emission sources at the depot are required to be permitted under the Federal Clean Air Act or companion Indiana regulations (DLA 2001a). Air permitting requirements and National Emission Standards for Hazardous Air Pollutants (NESHAP) are not applicable.

Most activity related to continued storage, such as inspections, is performed inside the warehouse and results in negligible or no noise impact on nearby noise sensitive areas. This is also the case for the last year of storage when a forklift would be used to move the overpack drums. There would be no modifications to the facilities that would result in changes in noise levels at nearby noise sensitive areas. Regular maintenance to the warehouses would continue and is not expected to result in any offsite noise impacts. There are no loud impulsive noises expected that would disturb wildlife. No increase in truck or rail traffic is expected other than for a few truck trips during the last year of storage when new flasks would be delivered and wastes from reflasking would be removed.

The current meteorology, air quality, and noise in the vicinity of the depot are described in Section 3.2.1.

4.2.1.2 Waste Management

Small amounts of waste would be generated at the New Haven Depot by continued storage of mercury under the No Action Alternative. This waste is expected to be similar to that generated by the past storage of mercury and therefore would be a portion of the waste generation rate described in Section 3.2.2. Because this waste is a continuation of the wastes currently managed at the site, no impacts are expected.

In order to bound the impacts of potential future waste generation, it is estimated that up to 120 leaking flasks of the 16,151 flasks in storage would have to be replaced when the drums are opened for inspection during the last year of storage (see Appendix C). Therefore, the scenario of 120 leaking flasks is unlikely to be realized, but was analyzed to bound potential impacts of this alternative.

It is estimated that opening drums, inspecting flasks, and repackaging the contents of up to 120 leaking flasks could generate up to 1,200 lb (544 kg), of hazardous solid waste (e.g., mercury-contaminated pads, wipes, and liners), and up to 2.2 yd^3 (1.7 m^3) of nonhazardous solid waste (i.e., garbage), in addition to the 120 flasks. The waste flasks would be sent to a commercial mercury recovery facility for retorting to ensure that no mercury remains in or on the flasks. The decontaminated flasks would then be recycled or disposed of as nonhazardous waste. The hazardous waste would be accumulated on site and sent off site to a permitted commercial facility for waste treatment and/or disposal. Although the 1,200 lb (544 kg) of hazardous waste would exceed the 100 lb (45 kg) of hazardous waste typically generated each year at the New Haven Depot, this would be a one-time event that would not impact long-term waste management at the site. The nonhazardous waste would be collected and sent off site to a recycler or a landfill for disposal. The 2.2 yd^3 (1.7 m^3) of nonhazardous waste would be 2 percent of the 100 yd^3 (76 m^3) of nonhazardous waste typically generated each year at the depot. Because these wastes would be managed at offsite permitted facilities that are experienced in handling these types of wastes, only negligible, short-term impacts are expected.

4.2.1.3 Socioeconomics

Employment levels at the New Haven Depot would remain constant under the No Action Alternative, with only 0.24 full-time equivalent (FTE) associated with mercury storage. Thus, negligible impacts on socioeconomic conditions near the site are expected.

4.2.1.4 Human Health and Ecological Risk from Normal Operations

Under normal operating conditions, exposures could arise from small amounts of elemental mercury vapor escaping the storage containers. Mercury vapor transported downwind could then be inhaled by site workers or nearby offsite individuals. For analysis purposes, the public is conservatively represented by an individual located at the New Haven Depot fence line (the closest hypothetical offsite individual).

However, a release of mercury is very unlikely to occur at the depot because the flasks are stored inside sealed drums, the stockpile is periodically inspected, the concentration of mercury in the air in the warehouse is monitored, and immediate action is required should the level reach 25,000 ng/m^3. During the last year of storage, there would be more of an opportunity for elevated concentrations of mercury in the air because all the drums would be opened and the flasks inspected. The mercury in any flasks found to be leaking would be placed in new flasks.

The chronic benchmark concentration of 50,000 ng/m^3 established by the National Institute for Occupational Safety and Health (NIOSH) is the benchmark against which estimated exposure point concentrations (EPCs) for workers are compared. For chronic exposure to the public (i.e., offsite individuals), a much more sensitive reference concentration of 300 ng/m^3 established by the U.S. Environmental Protection Agency (EPA) is used. EPA's reference concentration is an "estimate … of daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (EPA 2002a). Different health-based benchmarks apply to site workers and offsite individuals due to the limited duration of occupational exposures (about 8 hours per day) as compared to the 24-hour-per-day duration assumed for the public.

Soil and surface water may become contaminated by airborne releases of mercury. Exposures to mercury deposited onto soil, sediment, and surface water are expected to be the greatest risks for plants and animals within the affected area, i.e., ecological receptors. Because mercury deposited onto soil or into water bodies is persistent, chronic exposure to contaminated soil and water is assumed. This assumption is conservative for accidental releases because spills are likely to be mitigated by cleanup operations. Exposure to mercury by inhalation in air or suspended particles is assumed to be negligible. The ecological risk assessment considers chronic exposures to a number of potentially sensitive ecological receptors: plants, soil invertebrates, the short-tailed shrew, the American robin, the red-tailed hawk, the great blue heron, aquatic biota, and sediment-dwelling (i.e., benthic) biota. The ecological health consequence levels for these receptors are expressed in terms of media- and receptor-specific ecological benchmark values that are the upper concentration limits for mercury in soil, sediment, and surface water (DLA 2003:1-3, 5-1).

For the New Haven Depot, a highly conservative assumption of 25,000 ng/m^3 long-term average mercury concentration[1] at the warehouse vent would result in a maximum estimated exposure of 43 ng/m^3 for both onsite workers and the public, both assumed to be located 492 ft (150 m) from the release (DLA 2003:4-3). This estimated exposure presents a negligible risk to onsite workers, offsite individuals, and ecological receptors (DLA 2003:4-15, 5-8).

Human health and ecological risks associated with soil contamination attributable to mercury released during normal operations are also considered negligible because any mercury released to the atmosphere would be in the form of elemental mercury. Elemental mercury has been found not to deposit near its source (up to distances of about 6 mi [9.6 km]), and given the extremely small amount of mercury that would be released from the New Haven Depot during normal operations, it would be indistinguishable from background mercury concentrations beyond that distance (DLA 2003:4-2).

4.2.1.5 Human Health and Ecological Risk from Facility Accidents

Risks from accidents have been classified both by anticipated frequency and severity of consequences into categories of negligible, low, moderate, and high risk. Risks were evaluated for exposure of ecological receptors to inorganic mercury and methyl mercury that could accumulate in dry soil, wetland soil, or surface water and sediment as a result of deposition of airborne mercury. It is assumed that mercury in soil, water, and sediment passes through the food chain to the receptors, which were chosen because they typically have high levels of exposure to deposited contaminants or represent species of particular concern. Given the dispersion characteristics of mercury, risks to ecological receptors (plants and animals within the affected area) from spills are considered to be negligible (DLA 2003:5-8).

Selected species were used to evaluate ecological risks. In particular, robins and shrews were chosen to represent highly exposed birds and small mammals with small home ranges. Because their diet is high in soil invertebrates (i.e., worms), which are highly exposed to soil contaminants by ingestion of and direct contact with soil, robins and shrews are more highly exposed to soil contaminants than most other birds and small mammals. Although robins and shrews may not be abundant at every site, it is expected that similar birds and small mammals are present in the vicinity of each of the sites. Therefore, robins and shrews are evaluated for each site as representative of the most highly exposed birds and small mammals.

Methyl mercury is used as the benchmark organic form of mercury for the ecological risk assessment because it is the most toxic form of mercury to birds, mammals and aquatic organisms. Elemental mercury released to the environment can be oxidized to ionic mercury through reactions with soil constituents, and both elemental and ionic mercury can be converted to methyl mercury under anaerobic conditions such as in surface water and sediment. Since two percent of the mercury released to dry soil, and fifteen percent of the mercury released to wetland soil and sediment, is assumed to convert to methyl mercury (EPA 1999), assuming that all mercury that can potentially be released to aquatic systems becomes methyl mercury is conservative. Mercury investigations generally focus on aquatic rather than terrestrial ecosystems due to methylation and bioaccumulation of methyl mercury in aquatic systems. Animals primarily associated with aquatic food chains accumulate more mercury in their bodies than

[1] The threshold limit value of 25,000 ng/m^3 is established by the American Conference of Governmental Industrial Hygienists. Threshold limit values represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. A discussion of factors that contribute to selection of this value as a highly conservative estimate for release from the stored mercury inventory may be found in Section 6.1.1 of the *Draft Human Health and Ecological Risk Assessment Report for the Mercury Management Environmental Impact Statement* (DLA 2003:6-1).

those associated with terrestrial food chains. Methyl mercury concentrations increase with higher levels in aquatic food chains (DLA 2003:5-1).

Information gathered from site visits to existing storage locations, telephone calls and document reviews were used to identify specific hazards associated with each alternative. Inspection reports for mercury storage areas were reviewed for information about past releases of mercury. Additional information about past releases is summarized in the *Mercury Investigation Report* (TVA 2000). There have been no reports of mercury escaping from any of the warehouses, and there is no known member of the public that has been affected at any of the existing storage locations (DLA 2003:2-2).

There have not been any spills of mercury resulting in environmental contamination over the decades in which the mercury stockpile has been maintained. This experience makes it likely that normal (incident-free) operations will continue at the storage facilities. The storage facilities are built to ensure containment of the mercury under most conditions. No incidents of spilled mercury overruning the catch pans (which can contain the contents of several flasks) or containment berms, or penetrating sealed concrete floors and reaching any surface water or groundwater sources before cleanup have been known to occur. For these reasons, the only initial release pathway from the stockpile is through the air (DLA 2003:2-2).

Accidents evaluated for the No Action Alternative and their postulated acute effects are presented in Table 4.2–1. The *Draft Risk Assessment Report* considered a range of possible accident scenarios and dismissed several before selecting this set of onsite accidents to analyze (DLA 2003). Accidents were dismissed either because their frequency of occurrence is negligible, or the risk is either negligible or bounded[2] by another scenario. In particular, the frequency of accidents resulting in a mercury release initiated by high winds or an aircraft or vehicle crashing into the storage building was determined to be negligible. The frequency of building fires initiated by lightning strikes, or by fires or explosions at nearby facilities was also determined to be negligible. The potential for a severe fire involving combustible materials associated with mercury storage operations was determined to be negligible. The risk from possible collapse or destruction of the storage facilities by heavy snows or tornadoes was determined to be bounded by the earthquake risk. Although the frequency of occurrence of wildfires is high at some of the proposed or existing storage locations, the likelihood that such a fire would consume any of the mercury storage facilities was determined to be negligible for a number of facility-specific reasons, including the structural material of the storage facilities, proximity to fire response services, presence of fire breaks, and control of vegetation.

The risk is negligible for all scenarios in Table 4.2–1 except for a facility worker involved in an earthquake, and the consequence levels are negligible for all scenarios except for a facility worker involved in an earthquake or a forklift fuel fire. However, the forklift fuel fire is considered to be a very conservative assessment because the worker is exposed for only 10 seconds, whereas the benchmark applies to a 30-minute exposure. Further, the resulting forklift fire risk is negligible because of the low levels of activity associated with the No Action Alternative. For the earthquake spill, the consequence for a worker in the immediate vicinity of the spill is mitigated by the fact that the benchmark immediately dangerous to life and health level applies to a tolerable exposure by a person for up to 30 minutes, so qualitatively, there is some margin to expect that the exposure would be much less for a person escaping the event (DLA 2003:4-4, 4-7).

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[2] A bounding analysis is an analysis of impacts or risks such that the result overestimates or describes a limit on (i.e., “bounds”) potential impacts or risks.

Table 4.2–1. Accidents Evaluated for the No Action Alternative and Postulated Consequences for Human Inhalation

Event	Receptor[a]	EPC (mg/m^3)	Benchmark (mg/m^3)	Ratio[b]	Consequence Level[c]	Frequency of Release[d]	Risk Level[e]
Single flask spill	Involved worker	0.16	10	0.02	Negligible	Moderate[f]	Negligible
	Noninvolved worker	0.016	10	0.002	Negligible	Moderate[f]	Negligible
	Public	0.00451	1.67	0.003	Negligible	Moderate[f]	Negligible
Single pallet spill	Involved worker	0.84	10	0.08	Negligible	Moderate	Negligible
	Noninvolved worker	0.0858	10	0.009	Negligible	Moderate	Negligible
	Public	0.024	1.67	0.01	Negligible	Moderate	Negligible
Earthquake spill	Involved worker	4.24	10	0.4	Low	Moderate	Low
	Noninvolved worker	0.433	10	0.04	Negligible	Moderate	Negligible
	Public	0.121	1.67	0.07	Negligible	Moderate	Negligible
Forklift fuel fire	Involved worker	2,216	10	213	High	Negligible	Negligible
	Noninvolved worker	8×10^{-22}	10	8×10^{-23}	Negligible	Negligible	Negligible
	Public	0.00002	1.67	0.00001	Negligible	Negligible	Negligible
	Maximum	1.13	1.67	0.7	Negligible	Negligible	Negligible

[a] Involved worker is located within the facility; noninvolved worker is located at 197 ft (60 m); public is located at 349 ft (120 m); maximum deposition at 1,824 ft (556 m).
[b] Ratio of EPC/Benchmark level.
[c] Consequence levels correspond to the following ratios of EPC/Benchmark: >10, high; >1 and ≤10, moderate; >0.1 and ≤1, low; 0.1, negligible.
[d] Frequency categories are defined in Table 4.1–2.
[e] Risk level, as defined in Table 4.1–3, is a function of consequence level range and frequency range. Note that if either consequence level or frequency is negligible, risk is negligible.
[f] High at the U.S. Department of Energy's Y–12 National Security Complex because flasks are not overpacked.
Key: EPC, exposure point concentration.
Source: DLA 2003:Tables 2-16, 4-2, 4-5.

Chronic consequences related to mercury deposition in the environment are evaluated for the forklift fuel fire because deposition is postulated to occur only as a result of a fire, during which the mercury is assumed to be converted to a divalent form that readily deposits. The forklift fuel fire scenario is considered to represent a reasonable worst-case for the assessment of an onsite fire because it represents the greatest potential threat of long-term consequences. The ingestion of soil contaminated with mercury represents the greatest plausible long-term human health threat from accident-related mercury releases (DLA 2003:4-6). Table 4.2–2 presents the risks to human and ecological receptors from the potential release of mercury to environmental media. For this scenario, it is conservatively assumed that all of the released mercury is converted by the fire to the divalent form, thus maximizing the predicted deposition.

The maximum soil concentration arising from dry deposition is estimated to be 0.47 mg/kg, about 2 percent of the human health benchmark of 23 mg/kg established by the EPA. The maximum EPC in soil occurs about 1,808 ft (551 m) from the fire. For soil contamination arising from combined wet and dry deposition (i.e., that which might arise if the fire occurred during a rainstorm), the soil concentration would increase continually as the distance from the fire decreases. The estimated soil mercury concentration arising from the combined dry and wet deposition to soil at the minimum distance that can be validly modeled, 328 ft (100 m) from the fire, is 2.56 mg/kg. This indicates that any area of concern for soil contamination for humans would be this close or closer to the fire, and would likely be cleaned up as part of the fire cleanup. The findings indicate that an onsite fire event is unlikely to pose adverse chronic human health effects related to soil located at least 328 ft (100 m) from the fire (DLA 2003:4-8).

As can be seen in Table 4.2–2, for ecological receptors, the consequence levels from the forklift fuel fire are negligible for most receptors for most cases of deposition of both inorganic and methyl mercury, although there are several cases for which the consequence levels are either low or moderate. However, for the No Action Alternative, the ecological risk for all receptors is negligible since the frequency of the scenario is negligible.

Table 4.2–2. Exposure Concentrations, Consequence Levels for Human and Ecological Receptors Exposed to Mercury Due to Onsite Forklift Fire

			Dry Deposition (mg/kg)[a]		Wet Deposition (mg/kg)[b]	
Receptor	**Medium**	**Parameter**	**Inorganic Mercury**	**Methyl Mercury**	**Inorganic Mercury**	**Methyl Mercury**
Human	Dry soil	Concentration	0.47[c]	NA	2.56[c]	NA
		Benchmark[d]	23	None	23	None
		Ratio	0.02	NA	0.11	NA
		Consequence level	Negligible	NA	Low	NA
Plants	Dry soil	Concentration	0.452	0.009	2.505	0.051
		Benchmark	0.3	None	0.3	None
		Ratio	1.506	NA	8.351	NA
		Consequence level	Low	NA	Low	NA
Soil invertebrates	Dry soil	Concentration	0.452	0.009	2.505	0.051
		Benchmark	0.1	2.5	0.1	2.5
		Ratio	4.52	0.0037	25.053	0.020
		Consequence level	Low	Negligible	High	Negligible
Short-tailed shrew	Dry soil	Concentration	0.452	0.009	2.505	0.051
		Benchmark	110	0.08	110	0.08
		Ratio	0.004	0.115	0.023	0.639
		Consequence level	Negligible	Negligible	Negligible	Negligible
American robin	Dry soil	Concentration	0.452	0.009	2.505	0.051
		Benchmark	2	0.01	2	0.01
		Ratio	0.226	0.920	1.253	5.110
		Consequence level	Negligible	Negligible	Low	Low
Red-tailed hawk	Dry soil	Concentration	0.452	0.009	2.505	0.051
		Benchmark	1619	6.86	1619	6.86
		Ratio	0.00028	0.001	0.0015	0.007
		Consequence level	Negligible	Negligible	Negligible	Negligible

Receptor	Medium	Parameter	Dry Deposition (mg/kg)[a]		Wet Deposition (mg/kg)[b]	
			Inorganic Mercury	Methyl Mercury	Inorganic Mercury	Methyl Mercury
Plants	Wetland soil	Concentration	0.392	0.069	2.173	0.384
		Benchmark	0.3	None	0.3	None
		Ratio	1.306	NA	7.243	NA
		Consequence level	Low	NA	Low	NA
Soil invertebrates	Wetland soil	Concentration	0.392	0.069	2.173	0.384
		Benchmark	0.1	2.5	0.1	2.5
		Ratio	3.919	0.028	21.729	0.153
		Consequence level	Low	Negligible	High	Negligible
Short-tailed shrew	Wetland soil	Concentration	0.392	0.069	2.173	0.384
		Benchmark	110	0.08	110	0.08
		Ratio	0.0036	0.865	0.020	4.794
		Consequence level	Negligible	Negligible	Negligible	Low
American robin	Wetland soil	Concentration	0.392	0.069	2.173	0.384
		Benchmark	2	0.01	2	0.01
		Ratio	0.196	6.920	1.086	38.350
		Consequence level	Negligible	Low	Low	High
Red-tailed hawk	Wetland soil	Concentration	0.392	0.069	2.173	0.384
		Benchmark	1619	6.86	1619	6.86
		Ratio	0.00024	0.010	0.0013	0.056
		Consequence level	Negligible	Negligible	Negligible	Negligible
Benthic invertebrates	Sediment	Concentration	0.980	0.173	5.432	0.959
		Benchmark	0.15	None	0.15	None
		Ratio	6.532	NA	36.215	NA
		Consequence level	Low	NA	High	NA
Great blue heron	Sediment	Concentration	0.980	0.173	5.432	0.959
		Benchmark	736	2.09	736	2.09
		Ratio	0.0013	0.083	0.0074	0.459
		Consequence level	Negligible	Negligible	Negligible	Negligible
Aquatic biota	Surface water	Concentration	1.38×10^{-3}	6.40×10^{-3}	7.65×10^{-3}	3.55×10^{-2}
		Benchmark	1.3	0.003	1.3	0.003
		Ratio	0.0011	2.286	0.0059	12.679
		Consequence level	Negligible	Low	Negligible	Moderate

Receptor	Medium	Parameter	Dry Deposition (mg/kg)[a] Inorganic Mercury	Dry Deposition (mg/kg)[a] Methyl Mercury	Wet Deposition (mg/kg)[b] Inorganic Mercury	Wet Deposition (mg/kg)[b] Methyl Mercury
Great blue heron	Surface water	Concentration	1.38×10^{-3}	6.40×10^{-3}	7.65×10^{-3}	3.55×10^{-2}
		Benchmark	1.4	0.032	1.4	0.032
		Ratio	0.0010	0.200	0.005	1.109
		Consequence level	Negligible	Negligible	Negligible	Low

[a] Dry deposition and concentrations of divalent mercury at 500 m (1641 ft) downwind (maximum concentration deposited). Surface water measured in mg/l.

[b] Wet deposition and concentrations of divalent mercury at 328 ft (100 m) downwind (maximum concentration deposited). Surface water measured in mg/l.

[c] Human exposure is based on total mercury (organic plus inorganic). Consequence levels for humans correspond to the following ratios: >10, high; <1 and ≤10, moderate; >0.1 and <1, low; <0.1, negligible.

[d] Ratio is exposure point concentration 328 ft (100 m)/Benchmark consequence levels for ecological receptors correspond to the following ratios: ≥20, high; >10 and <20, moderate; >1 and <10, low; <1, negligible.

Key: NA, not applicable.

Source: DLA 2003:Tables 4-6, 5-4.

4.2.1.6 Transportation

Because the mercury would remain in its current locations under the No Action Alternative, there are no transportation risks.

4.2.1.7 Geology and Soils

No impacts on geology and soils are anticipated at the New Haven Depot under the No Action Alternative because no new construction or other ground-disturbing activity is planned. Hazards from large-scale geologic conditions, such as earthquakes, and other site geologic conditions with the potential to affect existing mercury management facilities are summarized in Section 3.2.5. In general, the potential for geologic conditions to affect existing depot facilities is low. Although northeast Indiana has a relatively low seismicity, the region is not free of all seismic hazard. Earthquakes have historically produced ground motion effects equivalent to Modified Mercalli Intensity (MMI) VII to VIII in the region (see Appendix E, Table E–11). However, the predicted peak ground acceleration at the site from an earthquake with an annual probability of occurrence of 1 in 2,500 is 0.08g. Damage from such an event would likely be negligible to slight to ordinary structures but would be strongly felt. Thus, continued storage in existing facilities at the New Haven Depot should neither impact geologic or soil resources, nor be jeopardized by geologic conditions. An analysis of potential environmental consequences resulting from an earthquake-induced accident is presented in Section 4.2.1.5.

4.2.1.8 Water Resources

No construction-related ground disturbance is anticipated for continued storage activities at the New Haven Depot; therefore, there would be no construction impacts on either surface water or groundwater resources. As discussed in Section 4.2.1.12, mercury storage activities under the No Action Alternative would require a small volume of water. This water use would have a negligible impact on groundwater availability overall. Likewise, there would be no increase in wastewater generation and no impact on wastewater treatment facility effluents or on groundwater or surface water quality.

Mercury flasks would continue to be stored in overpack drums (grouped in drip pans on wooden pallets) within the existing warehouse, which has sealed, concrete flooring. Appropriate best management practices for material storage and handling, including periodic visual inspections of mercury storage pallets and mercury vapor monitoring, would continue. Also, adequate structural controls such as the use of additional containment would continue to be employed and maintained to ensure that spills or leaks do not reach soils or surfaces where they could be conveyed to surface waters or groundwater. All depot activities would be conducted in accordance with a current Spill Prevention Control and Countermeasures (SPCC) and Installation Spill Contingency (ISC) Plans and applicable policies and procedures that address spill prevention, response, and cleanup. Additionally, a Storm Water Pollution Prevention Plan (SWPPP) has been implemented at the depot to ensure that contact between storm water runoff and pollutants is minimized (see Section 3.2.6.1).

4.2.1.9 Ecological Resources

Under the No Action Alternative, there would be no construction or demolition of buildings for mercury storage. Any modifications, including roof replacement, required to maintain safe storage would not likely result in appreciable changes to current conditions. As described in Section 1.2.3, flasks are stored in lined, 30-gal steel drums and visual inspections and air monitoring would detect any leaks. Even if a leak were to occur, mercury would not escape the warehouse because the floors are sealed, there are no floor drains, and the drums are stored on drip pans. Therefore, because there is no land disturbance and there would be negligible or no emissions of mercury, no impacts on ecological resources, including terrestrial and aquatic resources, wetlands, and threatened and endangered species, are anticipated.

4.2.1.10 Cultural Resources

Under the No Action Alternative, mercury would continue to be stored in existing facilities at the New Haven Depot. Because there would be no new construction and onsite property would not be disturbed, no impacts on cultural resources are expected.

4.2.1.11 Land Use and Visual Resources

No impacts on land use and visual resources are anticipated at the New Haven Depot under the No Action Alternative because no new construction or facility modifications would be required. Onsite land use would remain predominantly light industrial. Mercury storage activities at the depot would continue to require approximately 43,200 ft^2 (4,013 m^2) of existing warehouse space. No additional site acreage would be required. Onsite viewsheds and traffic flow to and from the depot would similarly not be affected. Scheduled maintenance to the warehouses would be consistent with the existing land use and visual character of the site. Continued storage of mercury stockpiles would likewise not be expected to affect offsite land uses and viewsheds from public vantage points in the vicinity of the New Haven Depot. Because there would be no change to the visual landscape as a result of this alternative, there would be no associated change in Bureau of Land Management (BLM) Visual Resource Management (VRM) classifications.

4.2.1.12 Infrastructure

Continued storage of mercury stockpiles would require approximately 5.1 MWh/yr of electricity. Approximately 1,352 gal/yr (5,118 l/yr) of water would also be required. With the exception of a minor increase in the need for propane and/or gasoline to operate forklifts for year 40 reflasking, no fuels are required for the continued storage of mercury stockpiles at the New Haven Depot. The current transportation, electricity, fuel, water, and site safety services, as described in Section 3.2.10, are capable of supporting all anticipated activities associated with this alternative. Because no new construction or change in mercury storage operations is anticipated, impacts on infrastructure would be negligible at the New Haven Depot under the No Action Alternative.

Transport of materials for inspection and reflasking during the last year of the 40-year storage period is not expected to result in an appreciable increase in traffic along the roads and rails leading into the depot. Transportation associated with the No Action Alternative would produce four truck trips and a small number of vehicle trips during this period (see Appendix C). This alternative would not appreciably add to the impacts of the 91,500 and 40,950 vehicle trips that occur monthly on Dawkins Road and Ryan Road, respectively (see Section 3.2.1.3).

4.2.1.13 Environmental Justice

As described in Section 3.2.11, minority and low-income populations are not concentrated near the depot. Therefore, no disproportionately high and adverse effects are expected on minority and low-income populations.

4.2.2 Somerville Depot

4.2.2.1 Meteorology, Air Quality, and Noise

Meteorological events such as heavy snow, tornadoes, high winds, and lightning can result in damage to buildings such as the mercury storage warehouses. The frequency and consequence of such events were considered in selecting the accident events described in Section 4.2.1.5 for the New Haven Depot. These events are also applicable to the Somerville Depot.

Impacts on air quality and noise are anticipated to be negligible at the Somerville Depot under the No Action Alternative.

The primary sources of criteria pollutants at the Somerville Depot are the three natural gas heating units, one oil-fired heating unit, and material-handling equipment (forklifts, tractors, and trucks). No active air emissions sources at the depot are required to be permitted under the Federal Clean Air Act or companion New Jersey regulations (DLA 2001b). Air permitting requirements and NESHAP are not applicable.

Most activity related to continued storage, such as inspections, is performed inside the warehouse and results in negligible or no noise impact on nearby noise sensitive areas. This is also the case for the last year of storage when a forklift would be used to move the overpack drums. There would be no modifications to the facilities that would result in changes in noise levels at nearby noise sensitive areas. Regular maintenance to the warehouses would continue and is not expected to result in any offsite noise impacts. There are no loud impulsive noises expected that would disturb wildlife. No increase in truck or rail traffic is expected other than for a few truck trips during the last year of storage when new flasks would be delivered and wastes from reflasking would be removed.

The current meteorology, air quality, and noise in the vicinity of the depot are described in Section 3.3.1.

4.2.2.2 Waste Management

Small amounts of waste would be generated at the Somerville Depot by continued storage of mercury under the No Action Alternative. This waste is expected to be similar to that generated by the past storage of mercury and therefore would be a portion of the waste generation rate described in

Section 3.3.2. Because this waste is a continuation of the wastes currently managed at the site, no impacts are expected.

In order to bound the impacts of potential future waste generation, it is estimated that up to 564 leaking flasks of the 75,880 flasks in storage would have to be replaced when the drums are opened for inspection during the last year of storage (see Appendix C). Information gained during a recent inspection of flasks at the New Haven, Somerville, and Warren depots before overpacking revealed 7 leaking flasks out of the 108,386 flasks inspected. Therefore, the scenario of 564 leaking flasks is unlikely to be realized, but was analyzed to bound potential impacts of this alternative. None of the leaking flasks was at the Somerville Depot.

It is estimated that opening drums, inspecting flasks, and repackaging the contents of up to 564 leaking flasks could generate up to 5,640 lb (2,558 kg), of hazardous solid waste (e.g., mercury-contaminated pads, wipes, and liners), and up to 10.4 yd^3 (8.0 m^3) of nonhazardous solid waste (i.e., garbage), in addition to the 564 old flasks. The waste flasks would be sent to a commercial mercury recovery facility for retorting to ensure that no mercury remains in or on the flasks. The decontaminated flasks would then be recycled or disposed of as nonhazardous waste. The hazardous waste would be accumulated on site and sent off site to a permitted commercial facility for waste treatment and/or disposal. Although the 5,640 lb (2,558 kg) of hazardous waste would exceed the 270 to 540 lbs (122 to 245 kg) of hazardous waste typically generated each year at the Somerville Depot, this would be a one-time event that would not impact long-term waste management at the site. The nonhazardous waste would be collected and sent off site to a recycler or a landfill for disposal. The 10.4 yd^3 (8.0 m^3) of nonhazardous waste is approximately 7 percent of the 150 yd^3 (115 m^3) of nonhazardous solid waste typically generated each year at the depot. Because these wastes would be managed at offsite permitted facilities that are experienced in handling these types of wastes, only negligible, short-term impacts are expected.

4.2.2.3 Socioeconomics

Employment levels at the Somerville Depot would remain constant under the No Action Alternative, with only 1.12 FTEs associated with mercury storage. Thus, negligible impacts on socioeconomic conditions near the site are expected.

4.2.2.4 Human Health and Ecological Risk from Normal Operations

Under normal operating conditions, exposures could arise from small amounts of elemental mercury vapor escaping the storage containers. Mercury vapor transported downwind could then be inhaled by site workers or nearby offsite individuals. For analysis purposes, the public is conservatively represented by an individual located at the Somerville Depot fence line (the closest hypothetical offsite individual).

A release of mercury is very unlikely to occur at the depot because the flasks are stored inside sealed drums, the stockpile is routinely inspected, the concentration of mercury in the air in the warehouse is monitored, and immediate action is required should the level reach 25,000 ng/m^3. During the last year of storage, there would be more of an opportunity for elevated concentrations of mercury in the air because all the drums would be opened and the flasks inspected. The mercury in any flasks found to be leaking would be placed into new flasks.

The chronic benchmark concentration of 50,000 ng/m^3 established by NIOSH is the benchmark against which EPCs for workers are compared. For the public (i.e., offsite individuals), a much more sensitive reference concentration of 300 ng/m^3 established by the EPA is used, and the EPC is calculated at the nearest distance to the fence line. EPA's reference concentration is an "estimate … of daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (EPA 2002a). Different health-based benchmarks apply to site workers and offsite individuals due to the limited duration of occupational exposures (about 8 hours per day) as compared to the 24-hour-per-day duration assumed for the public.

Soil and surface water may become contaminated by airborne releases of mercury. Exposures to mercury deposited onto soil, sediment, and surface water are expected to be the greatest risk for plants and animals with in the affected area, i.e., ecological receptors. Because mercury deposited onto soil or into water bodies is persistent, chronic exposure to contaminated soil and water is assumed. This assumption is conservative for accidental releases because spills are likely to be mitigated by cleanup operations. Exposure to mercury by inhalation in air or suspended particles is assumed to be negligible. The ecological risk assessment considers chronic exposures to a number of potentially sensitive ecological receptors: plants, soil invertebrates, the short-tailed shrew, the American robin, the red-tailed hawk, the great blue heron, aquatic biota, and sediment-dwelling (i.e., benthic) biota. The ecological health consequence levels for these receptors are expressed in terms of media- and receptor-specific ecological benchmark values that are the upper concentration limits for mercury in soil, sediment and surface water (DLA 2003:1-3, 5-1).

For the Somerville Depot, a highly conservative assumption of 25,000 ng/m^3 long-term average mercury concentration a short distance downwind of the warehouse vent would result in a maximum estimated exposure of 90 ng/m^3 for both onsite workers and the public, both assumed to be located 328 ft (100 m) from the release (DLA 2003:4-3). This estimated exposure presents a negligible risk to onsite workers, offsite individuals, and ecological receptors (DLA 2003:4-15, 5-8).

Human health and ecological risks associated with soil contamination attributable to mercury released during normal operations are also considered negligible because any mercury released to the atmosphere would be in the form of elemental mercury. Elemental mercury has been found not to deposit near its source (up to distances of about 6 mi [9.6 km]), and given the extremely small amount of mercury that would be released from the Somerville Depot during normal operations, it would be indistinguishable from background mercury concentrations beyond that distance (DLA 2003:4-2).

4.2.2.5 Human Health and Ecological Risks from Facility Accidents

The accident scenarios, potential consequences, and risks are the same for the Somerville Depot as those discussed in Section 4.2.1.5 for the New Haven Depot.

4.2.2.6 Transportation

Because the mercury would remain in its current locations under the No Action Alternative, there are no transportation risks.

4.2.2.7 Geology and Soils

No impacts on geology and soils are anticipated at the Somerville Depot under the No Action Alternative because no new construction or other ground-disturbing activity is planned. Hazards from large-scale geologic conditions, such as earthquakes, and other site geologic conditions with the potential to affect existing mercury management facilities are summarized in Section 3.3.5. In general, the potential for geologic conditions to affect existing depot facilities is low. North-central New Jersey has a relatively low-to-moderate seismicity overall. Earthquakes have historically produced ground motion effects equivalent to MMI VII in the State (see Appendix E, Table E–11). The predicted peak ground acceleration at the site from an earthquake with an annual probability of occurrence of 1 in 2,500 is 0.20g. While ground motion in this range could cause slight to moderate damage to ordinary structures, damage to properly designed and constructed facilities would not be expected. Thus, continued storage in existing facilities at the Somerville Depot should neither impact geologic or soil resources, nor be jeopardized by geologic conditions. An analysis of potential environmental consequences resulting from an earthquake-induced accident is described in Section 4.2.1.5 for the New Haven Depot. This analysis is also applicable to the Somerville Depot.

4.2.2.8 Water Resources

No construction-related ground disturbance is anticipated for continued storage activities at the Somerville Depot; therefore, there would be no construction impacts on either surface water or groundwater resources. As further discussed in Section 4.2.2.12, mercury storage activities under the No Action Alternative would require a small volume of water. This water use would have a negligible impact on water supply availability overall. Likewise, there would be no increase in wastewater generation and no impact on wastewater treatment facility effluents or groundwater or surface water quality.

Mercury flasks would continue to be stored in overpack drums (grouped in drip pans on wooden pallets) within the existing warehouse, which has sealed, concrete flooring. Appropriate best management practices for material storage and handling, including periodic visual inspections of mercury storage pallets and mercury vapor monitoring, would continue. Also, structural controls such as concrete curbs would be maintained to ensure that spills or leaks do not reach soils or surfaces where they could be conveyed to surface waters or groundwater, including the Fifteen Basin Aquifer System, a Class I sole-source aquifer. All depot activities would be conducted in accordance with current SPCC and ISC Plans that address spill prevention, response, and cleanup. Additionally, a SWPPP has been implemented at the depot to ensure that contact between storm water runoff and pollutants is minimized (see Section 3.3.6.1).

4.2.2.9 Ecological Resources

Under the No Action Alternative, there would be no construction or demolition of buildings for mercury storage. Any modifications required to maintain safe storage would not likely result in appreciable changes to current conditions. As described in Section 1.2.3, flasks are stored in lined, 30-gal steel drums and visual inspections and air monitoring would detect any leaks. Even if a leak were to occur, mercury would not escape the warehouse because the floors are sealed, there are no floor drains, and the drums are stored in drip pans. Therefore, because there is no land disturbance and there would be negligible or no emissions of mercury, no impacts on ecological resources, including terrestrial and aquatic resources, wetlands, and threatened and endangered species, are anticipated.

4.2.2.10 Cultural Resources

Under the No Action Alternative, mercury would continue to be stored in existing facilities at the Somerville Depot. Because there would be no new construction and onsite property would not be disturbed, no impacts on cultural resources are expected.

4.2.2.11 Land Use and Visual Resources

No impacts on land use and visual resources are anticipated at the Somerville Depot under the No Action Alternative because no new construction or facility modifications would be required. Onsite land use would remain predominantly light industrial. Mercury storage activities at the depot would continue to require approximately 80,000 ft^2 (7,432 m^2) of existing warehouse space. No additional site acreage would be required. Onsite viewsheds and traffic flow to and from the depot would similarly not be affected. Scheduled maintenance to the warehouses would be consistent with the existing land use and visual character of the site. Continued storage of mercury stockpiles would likewise not be expected to affect offsite land uses and viewsheds from public vantage points in the vicinity of the Somerville Depot. Because there would be no change to the visual landscape as a result of this alternative, there would be no associated change in BLM VRM classifications.

4.2.2.12 Infrastructure

Continued storage of mercury stockpiles would require approximately 10.2 MWh/yr of electricity. Approximately 6,352 gal/yr (24,045 l/yr) of water would also be required. With the exception of a minor increase in the need for propane and/or gasoline to operate forklifts for year 40 reflasking, no fuels are required for the continued storage of mercury stockpiles at the Somerville Depot. The current transportation, electricity, fuel, water, and site safety services, as described in Section 3.3.10, are capable of supporting all anticipated activities associated with this alternative. Because no new construction or change in mercury storage operations is anticipated, impacts on infrastructure would be negligible at the Somerville Depot under the No Action Alternative.

Transport of materials for inspection and reflasking during the last year of the 40-year storage period is not expected to result in an appreciable increase in traffic along the roads and rails leading into the depot. Transportation associated with the No Action Alternative would produce four truck trips and a small number of vehicle trips during this period (see Appendix C). This alternative would not appreciably add to the impacts of the 830,700 vehicle trips that occur monthly on U.S. Route 206 (see Section 3.3.1.3).

4.2.2.13 Environmental Justice

As described in Section 3.3.11, minority and low-income populations are not concentrated near the depot. Therefore, no disproportionate adverse effects are expected to minority and low-income populations.

4.2.3 Warren Depot

4.2.3.1 Meteorology, Air Quality, and Noise

Meteorological events such as heavy snow, tornadoes, high winds, and lightning can result in damage to buildings such as the mercury storage warehouses. The frequency and consequence of such events were considered in selecting the accident events described in Section 4.2.1.5 for the New Haven Depot. These events are also applicable to the Warren Depot.

Impacts on air quality and noise are anticipated to be negligible at the Warren Depot under the No Action Alternative.

The primary sources of criteria pollutants at the Warren Depot are six furnaces, one boiler, a diesel-fueled fire pump, a water heater, and material-handling equipment (forklifts and trucks). No active air emission sources at the depot are required to be permitted under the Federal Clean Air Act or companion Ohio regulations (DLA 2001c). Air permitting requirements and NESHAP are not applicable.

Most activity related to continued storage, such as inspections, is performed inside the warehouse and results in negligible or no noise impact on nearby noise sensitive areas. This is also the case for the last year of storage when a forklift would be used to move the overpack drums. There would be no modifications to the facilities that would result in changes in noise levels at nearby noise sensitive areas. Regular maintenance to the warehouses would continue and is not expected to result in any offsite noise impacts. There are no loud impulsive noises expected that would disturb wildlife. No increase in truck or rail traffic is expected other than for a few truck trips during the last year of storage when new flasks would be delivered and wastes from reflasking would be removed.

The current meteorology, air quality, and noise in the vicinity of the depot are described in Section 3.4.1.

4.2.3.2 Waste Management

Small amounts of waste would be generated at the Warren Depot by continued storage of mercury under the No Action Alternative. This waste is expected to be similar to that generated by the past storage of mercury and therefore would be a portion of the waste generation rate described in Section 3.4.2. Because this waste is a continuation of the wastes currently managed at the site, no impacts are expected.

In order to bound the impacts of potential future waste generation, it is estimated that up to 121 leaking flasks of the 16,355 flasks in storage would have to be replaced when the drums are opened for inspection during the last year of storage (see Appendix C). Information gained during a recent inspection of flasks before overpacking revealed 7 leaking flasks out of the 108,386 flasks inspected. Therefore, the scenario of 121 leaking flasks is unlikely to be realized, but was analyzed to bound potential impacts of this alternative.

It is estimated that opening drums, inspecting flasks, and repackaging the contents of up to 121 leaking flasks could generate up to 1,220 lb (553 kg), of hazardous solid waste (e.g., mercury-contaminated pads, wipes, and liners), and up to 61 ft^3 (2.3 yd^3 or 1.7 m^3), of nonhazardous solid waste (i.e., garbage), in addition to the 121 old flasks. The waste flasks would be sent to a commercial mercury recovery facility for retorting to ensure that no mercury remains in or on the flasks. The decontaminated flasks would then be recycled or disposed of as nonhazardous waste. The hazardous waste would be accumulated on site and sent off site to a permitted commercial facility for waste treatment and/or disposal. Although the 1,220 lb (553 kg) of hazardous waste would exceed the 240 lb (109 kg) of hazardous waste typically generated each year at the Warren Depot, this would be a one-time event that would not impact long-term waste management at the site. The nonhazardous waste would be collected and sent off site to a recycler or a landfill for disposal. The 2.3 yd^3 (1.7 m^3) of nonhazardous waste would be less than 1 percent of the approximately 300 yd^3 (229 m^3) of nonhazardous solid waste typically generated each year at the depot. Because these wastes would be managed at offsite permitted facilities that are experienced in handling these types of wastes, only negligible, short-term impacts are expected.

4.2.3.3 Socioeconomics

Employment levels at the Warren Depot would remain constant under the No Action Alternative, with only 0.24 FTE associated with mercury storage. Thus, negligible impacts on socioeconomic conditions near the site are expected.

4.2.3.4 Human Health and Ecological Risk from Normal Operations

Under normal operating conditions, exposures could arise from small amounts of elemental mercury vapor escaping the storage containers. Mercury vapor transported downwind could then be inhaled by site workers or nearby offsite individuals. For analysis purposes, the public is conservatively represented by an individual located at the Warren Depot fence line (the closest hypothetical offsite individual).

A release of mercury is very unlikely to occur at the depot because the flasks are stored inside sealed drums, the stockpile is routinely inspected, the concentration of mercury in the air in the warehouse is monitored, and immediate action is required should the level reach 25,000 ng/m^3. During the last year of storage, there would be more of an opportunity for elevated concentrations of mercury in the air because all the drums would be opened and the flasks inspected. The mercury in any flasks found to be leaking would be placed into new flasks.

The chronic benchmark concentration of 50,000 ng/m^3 established by NIOSH is the benchmark against which EPCs for workers are compared. For the public (i.e., offsite individuals), a much more sensitive reference concentration of 300 ng/m^3 established by the EPA is used, and the EPC is calculated at the nearest distance to the fence line. EPA's reference concentration is an "estimate … of daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (EPA 2002a). Different health-based benchmarks apply to site workers and offsite individuals due to the limited duration of occupational exposures (about 8 hours per day) as compared to the 24-hour-per-day duration assumed for the public.

Soil and surface water may become contaminated by airborne releases of mercury. Exposures to mercury deposited onto soil, sediment, and surface water are expected to be the greatest risk for plants and animals within the affected area, i.e., ecological receptors. Because mercury deposited onto soil or into water bodies is persistent, chronic exposure to contaminated soil and water is assumed. This assumption is conservative for accidental releases because spills are likely to be mitigated by cleanup operations. Exposure to mercury by inhalation in air or suspended particles is assumed to be negligible. The ecological risk assessment considers chronic exposures to a number of potentially sensitive ecological receptors: plants, soil invertebrates, the short-tailed shrew, the American robin, the red-tailed hawk, the great blue heron, aquatic biota, and sediment-dwelling (i.e., benthic) biota. The ecological health consequence levels for these receptors are expressed in terms of media- and receptor-specific ecological benchmark values that are the upper concentration limits for mercury in soil, sediment, and surface water (DLA 2003:1-3, 5-1).

For the Warren Depot, a highly conservative assumption of 25,000 ng/m^3 long-term average mercury concentration at the warehouse vent would result in a maximum estimated exposure of 138 ng/m^3 for onsite workers assumed to be located 197 ft (60 m) from the release, and 68 ng/m^3 for the public assumed to be located 394 ft (120 m) from the release (DLA 2003:4-3). This estimated exposure indicates a negligible risk to onsite workers, offsite individuals, and ecological receptors (DLA 2003:4-15, 5-8).

Human health and ecological risks associated with soil contamination attributable to mercury released during normal operations are also considered negligible because any mercury released to the atmosphere would be in the form of elemental mercury. Elemental mercury has been found not to deposit near its source (up to distances of about 6 mi [9.6 km]), and given the extremely small amount of mercury that would be released from the Warren Depot during normal operations, it would be indistinguishable from background mercury concentrations beyond that distance (DLA 2003:4-2).

4.2.3.5 Human Health and Ecological Risk from Facility Accidents

The accident scenarios, potential consequences, and risks are the same for the Warren Depot as those discussed in Section 4.2.1.5 for the New Haven Depot.

4.2.3.6 Transportation

Because the mercury would remain in its current locations under the No Action Alternative, there are no transportation risks.

4.2.3.7 Geology and Soils

No impacts on geology and soils are anticipated at the Warren Depot under the No Action Alternative because no new construction or other ground-disturbing activity is planned. Hazards from large-scale geologic conditions, such as earthquakes, and other site geologic conditions with the potential to affect existing mercury management facilities are summarized in Section 3.4.5. In general, the potential for geologic conditions, including earthquakes, to affect existing depot facilities is low, although the Trumbull County area of northeast Ohio is bordered by regions with a relatively higher seismicity. As a result, the region is not free of all seismic hazard. Earthquakes have historically produced ground motion effects equivalent to MMI VI in the region (see Appendix E, Table E–11). The predicted peak ground acceleration at the site from an earthquake with an annual probability of occurrence of 1 in 2,500 is 0.08g. Damage from such an event would likely be negligible to slight to ordinary structures but would be strongly felt. Thus, continued storage in existing facilities at the Warren Depot should neither impact geologic or soil resources, nor be jeopardized by geologic conditions. An analysis of potential environmental consequences resulting from an earthquake-induced accident is described in Section 4.2.1.5 for the New Haven Depot. This analysis is also applicable to the Warren Depot.

4.2.3.8 Water Resources

No construction-related ground disturbance is anticipated for continued storage activities at the Warren Depot; therefore, there would be no construction impacts on either surface water or groundwater resources. As further discussed in Section 4.2.3.12, mercury storage activities under the No Action Alternative would require a small volume of water. This water use would have a negligible impact on water supply availability overall. Likewise, there would be no increase in wastewater generation and no impact on wastewater treatment facility effluents or on groundwater or surface water quality.

Mercury flasks would continue to be stored in overpack drums (grouped in drip pans on wooden pallets) within the existing warehouse, which has sealed, concrete flooring. Appropriate best management practices for material storage and handling, including periodic visual inspections of mercury storage pallets and mercury vapor monitoring, would continue. Also, adequate structural controls such as the use of additional containment would continue to be employed to ensure that spills or leaks do not reach soils or surfaces where they could be conveyed to surface waters or groundwater. All depot activities would be conducted in accordance with current SPCC and ISC Plans that address spill prevention, response, and cleanup. Additionally, a SWPPP has been implemented at the depot to ensure that contact between storm water runoff and pollutants is minimized (see Section 3.4.6.1).

4.2.3.9 Ecological Resources

Under the No Action Alternative, there would be no construction or demolition of buildings for mercury storage. Any modifications required to maintain safe storage would not likely result in appreciable changes to current conditions. As described in Section 1.2.3, flasks are stored in lined, 30-gal steel drums and visual inspections and air monitoring would detect any leaks. Even if a leak were to occur, mercury would not escape the warehouse because the floors are sealed, there are no floor drains, and the drums are stored in drip pans. Therefore, because there is no land disturbance and there would be negligible or no emissions of mercury, no impacts on ecological resources, including terrestrial and aquatic resources, wetlands, and threatened and endangered species, are anticipated.

4.2.3.10 Cultural Resources

Under the No Action Alternative, mercury would continue to be stored in existing facilities at the Warren Depot. Because there would be no new construction and onsite property would not be disturbed, no impacts on cultural resources are expected.

4.2.3.11 Land Use and Visual Resources

No impacts on land use and visual resources are anticipated at the Warren Depot under the No Action Alternative because no new construction or facility modifications would be required. Onsite land use would remain predominantly light industrial. Mercury storage activities at the depot would continue to require approximately 40,000 ft^2 (3,716 m^2) of existing warehouse space. No additional site acreage would be required. Onsite viewsheds and traffic flow to and from the depot would similarly not be affected. Scheduled maintenance to the warehouses would be consistent with the existing land use and visual character of the site. Continued storage of mercury stockpiles would likewise not be expected to affect offsite land uses and viewsheds from public vantage points in the vicinity of the depot. Because there would be no change to the visual landscape as a result of this alternative, there would be no associated change in BLM VRM classifications. Continued use of the Warren Depot would require renegotiation of the lease that expires in 2010.

4.2.3.12 Infrastructure

Continued storage of mercury stockpiles would require approximately 5.1 MWh/yr of electricity. Approximately 1,367 gal/yr (5,175 l/yr) of water would also be required. With the exception of a minor increase in the need for propane and/or gasoline to operate forklifts for year 40 reflasking, no fuels are required for the continued storage of mercury stockpiles at the Warren Depot. The current transportation, electricity, fuel, water, and site safety services, as described in Section 3.4.10, are capable of supporting all anticipated activities associated with this alternative. Because no new construction or change in mercury storage operations is anticipated, impacts on infrastructure would be negligible at the Warren Depot under the No Action Alternative.

Transport of materials for inspection and reflasking during the last year of the 40-year storage period is not expected to result in an appreciable increase in traffic along the roads and rails leading into the depot. Transportation associated with the No Action Alternative would produce four truck trips and a small number of vehicle trips during this period (see Appendix C). This alternative would not appreciably add to the impacts of the 287,100 vehicle trips that occur monthly on Route 69 (Niles-Warren River Road) (see Section 3.4.1.3).

4.2.3.13 Environmental Justice

As described in Section 3.4.11, minority and low-income populations are not concentrated near the depot. Therefore, no disproportionately high and adverse effects are expected on minority and low-income populations.

4.2.4 U.S. Department of Energy's Y–12 National Security Complex

4.2.4.1 Meteorology, Air Quality, and Noise

Meteorological events such as heavy snow, tornadoes, high winds, and lightning can result in damage to buildings such as the mercury storage warehouses. The frequency and consequence of such events were considered in selecting the accident events described in Section 4.2.1.5 for the New Haven Depot. These events are also applicable to U.S. Department of Energy's (DOE's) Y–12 National Security Complex (Y–12).

Impacts on air quality and noise are anticipated to be negligible at the DOE's Y–12 under the No Action Alternative.

The primary sources of criteria pollutants at Y–12 are the steam plant and vehicle emissions (DOE 1996:3-192; Hamilton et al. 1999). These impacts are only a fraction of those contributions listed for the total Oak Ridge Reservation emissions in Table 3.5–1, and are well below the ambient air quality standards. NESHAP is not applicable.

Most activity related to continued storage, such as inspections, is performed inside the warehouse and results in negligible or no noise impact on nearby noise sensitive areas. There would be no modifications to the facilities that would result in changes in noise levels at nearby noise sensitive areas. Regular maintenance to the warehouses would continue and is not expected to result in any offsite noise impacts. There are no loud impulsive noises expected that would disturb wildlife. No increase in truck or rail traffic is expected other than for a few truck trips when new flasks are delivered and wastes from any reflasking removed.

The current meteorology, air quality, and noise in the vicinity of Y–12 are described in Section 3.5.1.

4.2.4.2 Waste Management

Small amounts of waste would be generated at Y–12 by continued storage of mercury under the No Action Alternative. This waste is expected to be similar to that generated by the past storage of mercury and therefore would be a small portion of the waste generation rate described in Section 3.5.2. Because this waste is a continuation of the wastes currently managed at the site, no impacts are expected.

In order to bound the impacts of potential future waste generation, it is estimated that up to 151 leaking flasks of the 20,276 flasks in storage would have to be replaced (see Appendix C). As described in Section 2.2.1, Y–12 mercury is contained in newer seamless flasks. Therefore, the scenario of 151 leaking flasks is unlikely to be realized, but was analyzed to bound potential impacts of this alternative.

It is estimated that repackaging the contents of up to 151 leaking flasks could generate up to 1,500 lb (680 kg), of hazardous solid waste (e.g., mercury-contaminated gloves, wipes, and pallets), and up to 75 ft^3 (2.8 yd^3 or 2.1 m^3), of nonhazardous solid waste (i.e., garbage), in addition to the 151 old flasks.

The waste flasks would be sent to a commercial mercury recovery facility for retorting to ensure that no mercury remains in or on the flasks. The decontaminated flasks would then be recycled or disposed of as nonhazardous waste. The 1,500 lb (680 kg) of hazardous waste would be a small fraction of the 14.3 tons (13 metric tons) of hazardous waste typically generated each year at Y–12 from routine operations and would not impact long-term waste management at the site. The hazardous waste would be shipped off site for treatment and disposal at commercial facilities. Likewise, the 2.8 yd^3 (2.1 m^3) of nonhazardous waste would be a small fraction of the 9,956 yd^3 (7,612 m^3) of nonhazardous solid waste typically generated from routine operations each year at Y–12 and would not impact long-term waste management at the site. The nonhazardous waste would be disposed of in an appropriate landfill. As such, management of these wastes would result in only negligible, short-term impacts.

4.2.4.3 Socioeconomics

Employment levels at Y–12 would remain constant under the No Action Alternative, with only 0.046 FTE associated with the storage of DNSC mercury. Thus, negligible impacts on socioeconomic conditions near the site are expected.

4.2.4.4 Human Health and Ecological Risk from Normal Operations

Under normal operating conditions, exposures could arise from small amounts of elemental mercury vapor escaping the storage containers. Mercury vapor transported downwind could then be inhaled by site workers or nearby offsite individuals. For analysis purposes, the public is conservatively represented by an individual located at the Y–12 fence line (the closest hypothetical offsite individual). A release of mercury is very unlikely to occur at Y–12 because the stockpile is routinely inspected, the concentration of mercury in the air in the warehouse is monitored, and immediate action is required should the level reach 25,000 ng/m^3.

The chronic benchmark concentration of 50,000 ng/m^3 established by NIOSH is the benchmark against which estimated EPCs for workers are compared. For the public (i.e., offsite individuals), a much more sensitive reference concentration of 300 ng/m^3 established by the EPA is used. EPA's reference concentration is an "estimate … of daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (EPA 2002a). Different health-based benchmarks apply to site workers and offsite individuals due to the limited duration of occupational exposures (about 8 hours per day) as compared to the 24-hour-per-day duration assumed for the public.

Soil and surface water may become contaminated by airborne releases of mercury. Exposures to mercury deposited onto soil, sediment, and surface water are expected to be the greatest risk for plants and animals within the affected area, i.e., ecological receptors. Because mercury deposited onto soil or into water bodies is persistent, chronic exposure to contaminated soil and water is assumed. This assumption is conservative for accidental releases because spills are likely to be mitigated by cleanup operations. Exposure to mercury by inhalation in air or suspended particles is assumed to be negligible. The ecological risk assessment considers chronic exposures to a number of potentially sensitive ecological receptors: plants, soil invertebrates, the short-tailed shrew, the American robin, the red-tailed hawk, the great blue heron, aquatic biota, and sediment-dwelling (i.e., benthic) biota. The ecological health consequence levels for these receptors are expressed in terms of media- and receptor-specific ecological benchmark values that are the upper concentration limits for mercury in soil, sediment, and surface water (DLA 2003:1-3, 5-1).

For Y–12, a highly conservative assumption of 25,000 ng/m^3 long-term average mercury concentration at the warehouse vent would result in a maximum estimated exposure 14 ng/m^3 for onsite workers assumed to be located 820 ft (250 m) from the release, and 1 ng/m^3 for the public assumed to be located 3,150 ft (960 m) from the release (DLA 2003:4-3). This estimated exposure presents a negligible risk to onsite workers, offsite individuals, and ecological receptors (DLA 2003:4-15, 5-8).

Human health and ecological risks associated with soil contamination attributable to mercury released during normal operations are also considered negligible because any mercury released to the atmosphere would be in the form of elemental mercury. Elemental mercury has been found not to deposit near its source (up to distances of about 6 mi [9.6 km]), and given the extremely small amount of mercury that would be released from Y–12 during normal operations, it would be indistinguishable from background mercury concentrations beyond that distance (DLA 2003:4-2).

4.2.4.5 Human Health and Ecological Risk from Facility Accidents

The accident scenarios, potential consequences, and risks are the same for Y–12 as those discussed in Section 4.2.1.5 for the New Haven Depot.

4.2.4.6 Transportation

Because the mercury would remain in its current locations under the No Action Alternative, there are no transportation risks.

4.2.4.7 Geology and Soils

No impacts on geology and soils are anticipated at Y–12 under the No Action Alternative because no new construction or other ground-disturbing activity is planned. Hazards from large-scale geologic conditions, such as earthquakes, and other site geologic conditions with the potential to affect existing mercury management facilities are summarized in Section 3.5.5. In general, the potential for geologic conditions to affect existing facilities is low to moderate. East-central Tennessee has a relatively moderate seismicity. Earthquakes have historically produced ground motion effects equivalent to MMI VI at the site, and the maximum predicted earthquake for Y–12 could produce intensities of up to MMI VIII (see Appendix E, Table E–11). The predicted peak ground acceleration at the site from an earthquake with an annual probability of occurrence of 1 in 2,500 is 0.27g. While ground motion in this range could cause considerable damage to ordinary structures, damage to properly designed and constructed facilities would not be expected. Thus, continued storage in existing facilities at Y–12 should neither impact geologic or soil resources, nor be jeopardized by geologic conditions. An analysis of potential environmental consequences resulting from an earthquake-induced accident is described in Section 4.2.1.5 for the New Haven Depot. This analysis is also applicable to Y–12.

4.2.4.8 Water Resources

No construction-related ground disturbance is anticipated for continued storage activities at Y–12; therefore, there would be no construction impacts on either surface water or groundwater resources. As further discussed in Section 4.2.4.12, mercury storage activities under the No Action Alternative would require a small volume of water. This water use would have no impact on water supply availability overall. Likewise, there would be no increase in wastewater generation and no impact on wastewater treatment facility effluents or on groundwater or surface water quality.

Mercury flasks would continue to be stored at the facility in wooden box pallets within the existing warehouse, which has epoxy-sealed, concrete floors. Appropriate best management practices for material storage and handling, including inspections of mercury storage locations and mercury vapor monitoring would continue. In particular, the existing warehouse facility within Y–12 has an angled floor that would direct any spilled mercury into a concrete collection trough that runs the entire length of the building (ADL 2000:34). This design provision greatly facilitates spill response and cleanup and helps to ensure that spills or leaks do not reach soils or surfaces where they could be conveyed to surface waters or groundwater. All activities would be conducted in accordance with applicable DOE policies and procedures that address spill prevention, response, and cleanup. Although no SPCC Plan has been implemented for the facility, a SWPPP has been implemented for Y–12 as a whole to ensure that contact between storm water runoff and pollutants is minimized (ADL 2000:35) (see Section 3.5.6.1).

4.2.4.9 Ecological Resources

Under the No Action Alternative, there would be no construction or demolition of buildings for mercury storage. Any modifications required to maintain safe storage would not likely result in appreciable changes to current conditions. As described in Sections 2.2.1 and 2.2.4, Y–12 mercury is contained in newer seamless flasks, which are routinely inspected, including air monitoring. Even if a leak were to occur, mercury would not escape the warehouse because the floors and catch basin are sealed with epoxy and there are no floor drains. Therefore, because there is no land disturbance and there would be negligible or no emissions of mercury, no impacts on ecological resources, including terrestrial and aquatic resources, wetlands, and threatened and endangered species, are anticipated.

4.2.4.10 Cultural Resources

Under the No Action Alternative, mercury would continue to be stored in existing facilities at Y–12. Because there would be no new construction and onsite property would not be disturbed, no impacts on cultural resources are expected.

4.2.4.11 Land Use and Visual Resources

No impacts on land use and visual resources are anticipated at Y–12 under the No Action Alternative because no new construction or facility modifications would be required. Onsite land use would remain predominantly industrial. Mercury storage activities at Y–12 would continue to require approximately 4,400 ft^2 (409 m^2) of existing warehouse space. No additional site acreage would be required. Onsite viewsheds and traffic flow to and from the storage facility would similarly not be affected. Continued storage of mercury stockpiles would likewise not be expected to affect offsite land uses and viewsheds from public vantage points in the vicinity of Y–12. Because there would be no change to the visual landscape as a result of this alternative, there would be no associated change in BLM VRM classifications.

4.2.4.12 Infrastructure

Continued storage of mercury stockpiles would require approximately 0.2 MWh/yr of electricity. Approximately 261 gal/yr (988 l/yr) of water would also be required. With the exception of a minor increase in the need for propane and/or gasoline to operate forklifts for year 40 reflasking, no fuels are required for the continued storage of mercury stockpiles at Y–12. The current transportation, electricity, fuel, water, and site safety services, as described in Section 3.3.10, are capable of supporting all anticipated activities associated with this alternative. Because no new construction or change in mercury storage operations is anticipated, impacts on infrastructure would be negligible at Y–12 under the No Action Alternative.

Transport of the mercury would not be expected to result in an appreciable increase in traffic along the roads and rails leading into the depot. Transportation associated with the No Action Alternative would produce 320 truck trips and 160 automobile trips over the 40-year period of analysis (see Appendix C). This amounts to an average of approximately one vehicle trip per month. This alternative would not appreciably add to the impacts of the 3,234 vehicle trips per day on West Bear Creek Road that are expected to occur due to other activities at Y–12 (DOE 2001:5-7).

4.2.4.13 Environmental Justice

As described in Section 3.5.11, there is a concentration of minority and low-income individuals near Y–12. As discussed in Sections 4.2.4.4 and 4.2.4.5, the No Action Alternative would result in negligible offsite human health and ecological risks from mercury emissions during normal operations and accidents. Therefore, no disproportionately high and adverse effects on minority and low-income populations would occur from the No Action Alternative.

4.2.5 Other Sites

Under the No Action Alternative, activities at the Hawthorne Army Depot, PEZ Lake Development, and the Utah Industrial Depot would continue as before, with no mercury transported to the site for storage. Therefore, no environmental or socioeconomic impacts from mercury storage would occur at these sites under the No Action Alternative.

4.3 ALTERNATIVE 2: CONSOLIDATED STORAGE

This MM EIS considers consolidated, long-term storage (40 years) of all the elemental mercury at six locations (see Table 4.3–1).

Table 4.3–1. Consolidated Storage Alternatives

Consolidated Storage Location	Alternative	Current Inventory[a]		Consolidated Inventory	
		Flasks	Tons	Flasks	Tons
New Haven Depot	2A	16,151	614	128,662	4,890
Somerville Depot	2B	75,880	2,885	128,662	4,890
Warren Depot	2C	16,355	621	128,662	4,890
Hawthorne Army Depot	2D	0	0	128,662	4,890
PEZ Lake Development	2E	0	0	128,662	4,890
Utah Industrial Depot	2F	0	0	128,662	4,890

[a] An additional 20,276 flasks (770 tons [699 metric tons]) are currently stored at the U.S. Department of Energy's Y–12 National Security Complex in Oak Ridge, Tennessee.

Source: Chapter 3 and Appendix C of this MM EIS.

Moving all the mercury to one of these consolidated storage locations would have an overall long-term beneficial impact in that resources would only need to be committed to maintain the mercury stockpile at one location, and the warehouse space currently being used to store mercury at other sites (at Y–12 and/or the New Haven, Somerville, and Warren depots) would be available for other beneficial uses or could be decontaminated and decommissioned. The impacts of removing the mercury from existing storage locations are comparable to the impacts of removing the mercury from the existing storage locations under the Sales to Reduce Mercury Mining Alternative, as described in Section 4.5.1.

There would be some impacts at the current mercury storage locations during the shipping period when truck or rail traffic would increase slightly. Table 4.3–2 presents the additional truck or rail shipments that would originate from each of the current storage locations and be completed within the course of a few months. Over this period, staging and loading activities would generally take place inside existing warehouses, and the increased traffic flow associated with transporting the mercury would result in negligible to minor, short-term impacts at these locations. Once removal of the mercury from each site is completed, the existing storage facilities would be available for potential closure, decommissioning, or reuse. The impacts of decontamination of the vacated warehouses are discussed in Section 4.6.

Table 4.3–2. Estimated Additional Traffic at the Current Mercury Storage Locations Associated with Shipping to the Consolidated Storage Location

Current Mercury Storage Location	Additional Truck Shipments	Additional Rail Shipments
New Haven Depot	39	20
Somerville Depot	181	91
Warren Depot	39	20
Y−12	49	25

Note: The number of trips to ship mercury under the Sales to Reduce Mercury Mining Alternative is the same as the number of trips required to ship mercury to a consolidated storage location.

Key: Y–12, U.S. Department of Energy's National Security Complex.

Source: Appendix C, Table C–3.

The impacts of consolidated storage on each resource area, and the degree to which these impacts would vary among the proposed consolidated storage locations, are described in the sections that follow.

4.3.1 Meteorology, Air Quality, and Noise

Meteorological events such as heavy snow, tornadoes, high winds, and lightning can result in damage to buildings such as the mercury storage warehouses. The frequency and consequence of such events were considered in selecting the accident events evaluated in Section 4.3.5.

Minor short-term air quality impacts would result from an increase in truck or rail activity while mercury is moved to each consolidated storage location. Table 4.3–3 presents the number of truck or rail shipments that would be required to transport all of the elemental mercury to each consolidated storage location. These truck or rail shipments are expected to be completed within, at most, a period of several months. With either transport mode, the resulting short-term increase in air pollutant emissions along roads or rails used to access the depot would be expected to be minor compared to existing traffic emissions (e.g., the proposed truck trips, even if they were all to occur in 1 month, would be less than 1 percent of existing traffic levels at each consolidated storage location. Therefore, transport of the mercury would not be expected to result in air pollutant concentrations exceeding the applicable ambient air quality standards.

The use of trucks to move the mercury from the rail lines to the storage igloos at Hawthorne would result in only minor impacts to air quality. Additional truck transportation would not occur if storage buildings were used because direct rail access is provided for these buildings.

Table 4.3–3. Transportation Requirements Contributing to Air Quality and Noise Impacts Under the Consolidated Storage Alternative

Consolidated Storage Location	Existing Monthly Vehicle Trips for the Site	Existing Monthly Vehicle Trips for Nearby Roads	Additional Truck Shipments	Additional Rail Shipments
New Haven Depot	440 to 660	Dawkins Road – 91,500 Ryan Road – 40,950	268	134
Somerville Depot	790	U.S. 206 – 830,700	126	63
Warren Depot	440 to 880	State Route 169 – 287,100	267	134
Hawthorne Army Depot[a]	7,900	U.S. 95 – 81,000 State Route 362 – 31,500	308	156
PEZ Lake Development	9,900	State Route 96 – 92,850	308	156
Utah Industrial Depot	88,000	State Route 112 – 229,950	308	156

[a] Applies to consolidated storage in buildings and consolidated storage in igloos.

Source: Chapter 3 and Appendix C of this MM EIS; Cangro 2002; Smith 2002a.

Modifications to the facilities at each of the consolidated storage locations would result in negligible air pollutant emissions. Regular maintenance to the warehouses would continue and would result in some minor air pollutant emissions. Most activities related to storage, such as inspections, are performed inside the warehouse and result in negligible or no emissions of mercury to the air. Use of gasoline-powered electrical generators to supply lighting for inspections at Hawthorne would result in only minor air quality impacts. Air permitting requirements and NESHAP are not applicable.

Short-term noise impacts at the consolidated storage locations could also result from the increased truck or rail activity (Table 4.3–3) that would occur while mercury is moved to the site. At each consolidated storage location, the resulting increase in day-night average noise levels along roads or rails used to access the site would be expected to be less than 1 dBA. As such, the change in truck or rail traffic would not be expected to result in a change in noise levels along the shipping routes that would be noticeable to the public or result in an increase in annoyance.

There would be no modifications to the facilities that would cause changes in noise levels at nearby noise sensitive areas. Regular maintenance to the warehouses would continue and is not expected to result in any offsite noise impacts. Most activities related to storage, such as inspections are performed inside the warehouse and result in negligible or no noise impact on nearby noise sensitive areas. There are no loud impulsive noises expected that would disturb wildlife.

4.3.2 Waste Management

Although consolidated storage would not involve new construction at any of the proposed storage locations, small quantities of hazardous and nonhazardous wastes would be generated during storage operations. However, these wastes would result in negligible impacts on existing waste management activities.

A greater impact is possible when the drums are opened for inspection during the last year of storage. In order to bound the impacts of the potential waste generation, it is estimated that up to 956 leaking flasks of the 128,662 flasks in storage would have to be replaced (See Appendix C). Information gained during a recent inspection of flasks before an overpacking operation revealed 7 leaking flasks out of the 108,386 flasks inspected. Therefore, the scenario of 956 leaking flasks is unlikely to be realized, but was analyzed to bound potential impacts of this alternative.

It is estimated that opening drums, inspecting flasks, and repackaging the contents of up to 956 leaking flasks could generate up to 9,560 lb (4,336 kg) of hazardous solid waste (e.g., mercury-contaminated pads, wipes, and liners), and up to 17.7 yd^3 (13.5 m^3) of nonhazardous solid waste (i.e., garbage), in addition to the 956 old flasks. The waste flasks would be sent to a commercial mercury recovery facility for retorting to ensure that no mercury remains in or on the flasks. The decontaminated flasks would then be recycled or disposed of as nonhazardous waste. The hazardous waste would be accumulated on site and sent off site to a permitted commercial facility for waste treatment and/or disposal. The 9,560 lb (4,336 kg) of hazardous waste would exceed the annual levels of hazardous waste typically generated at each of the consolidated storage locations, except for at the Hawthorne Army Depot. However, this waste would be from a one-time event that should not impact long-term waste management at the site. If the accumulated amount of hazardous waste should exceed 2,205 lb (1,000 kg) in a calendar month, appropriate actions would be taken in accordance with Title 40 of the Code of Federal Regulations (CFR) 261.5(g)(2).

The 17.7 yd^3 (13.5 m^3) of nonhazardous waste would not exceed the annual levels of nonhazardous waste typically generated at each of the consolidated storage locations, except for the Somerville Depot. However, this waste also results from the same one-time event and should not impact long-term waste management at the site. The nonhazardous waste would be collected and sent off site to a recycler or a landfill for disposal.[3] Because these wastes would be managed at offsite permitted facilities that are experienced in handling these types of wastes, only minor, short-term impacts would be expected. Table 4.3–4 compares the current hazardous and nonhazardous waste generation rates of each consolidated storage location with the potential additional wastes resulting from inspection and repackaging under the Consolidated Storage Alternative.

Table 4.3–4. Potential Waste Management Impacts Under the Consolidated Storage Alternative

Consolidated Storage Location	Typical Annual Waste Generation	Potential Additional Waste Generated During Drum Inspection and Repackaging[a]
New Haven Depot		
Hazardous, lb	100	9,560
Nonhazardous, yd^3	100	17.7
Somerville Depot		
Hazardous, lb	270-540	9,560
Nonhazardous, yd^3	150	17.7
Warren Depot		
Hazardous, lb	240	9,560
Nonhazardous, yd^3	300	17.7
Hawthorne Army Depot[b]		
Hazardous, lb	104,590	9,560
Nonhazardous, yd^3	8,874	17.7

[3] The Hawthorne Army Depot could also send this nonhazardous waste to the onsite Construction and Debris Landfill.

Consolidated Storage Location	Typical Annual Waste Generation	Potential Additional Waste Generated During Drum Inspection and Repackaging[a]
PEZ Lake Development		
Hazardous, lb	1,500	9,560
Nonhazardous, yd^3	240	17.7
Utah Industrial Depot		
Hazardous, lb	NA	9,560
Nonhazardous, yd^3	1,200	17.7

a One-time event that occurs during the last year of storage.
b Applies to consolidated storage in buildings and consolidated storage in igloos.
Key: NA, not available.

4.3.3 Socioeconomics

Consolidated storage at the proposed storage locations could require up to 1.9 additional FTEs to meet operation and inspection requirements. Table 4.3–5 presents the specific labor requirements at each of the consolidated storage locations. At most of these locations, the additional labor requirements would likely be met by existing employees. Even if new employees were hired for these functions, the labor requirements would be minimal, with negligible impacts on socioeconomic conditions within the surrounding communities expected.

Table 4.3–5. Labor Requirements Under the Consolidated Storage Alternative

Consolidated Storage Location	County Work Force	Current Number of Workers	Current FTEs for Mercury Storage	FTEs for Consolidated Storage	Source of Additional Workers
New Haven Depot	174,169	13	0.24	1.9	Likely met by existing employees
Somerville Depot	173,243	17	1.12	1.9	Likely met by existing employees
Warren Depot	110,884	13	0.24	1.9	Likely met by existing employees
Hawthorne Army Depot[a]	2,038	480	0	1.9	Likely met by existing employees
PEZ Lake Development	15,319	120	0	1.9	Likely met by existing employees
Utah Industrial Depot	12,141	827	0	1.9	Likely met by existing employees

a Applies to consolidated storage in buildings and consolidated storage in igloos.

4.3.4 Human Health and Ecological Risk from Normal Operations

Potential human health risks associated with normal operating conditions at each consolidated storage location could arise from the escape of small amounts of elemental mercury vapor from the storage containers. Mercury vapor transported downwind could then be inhaled by site workers or nearby offsite individuals. Using a highly conservative assumption of 25,000 ng/m^3, long-term average mercury concentration at the warehouse vent would result in the maximum estimated exposures presented in Table 4.3–6. At each consolidated storage location, this estimated exposure would represent a negligible risk to onsite workers, offsite individuals, and ecological receptors. A release of mercury at this concentration is very unlikely to occur at the consolidated storage location because the flasks would be stored inside sealed drums, the stockpile would be routinely inspected, the concentration of mercury in the air in the warehouse would be monitored, and immediate action is required should the level reach 25,000 ng/m^3. During the last year of storage, there would be more of an opportunity for elevated concentrations of mercury in the air because all the drums would be opened and the flasks inspected.[4] The mercury in any flasks found to be leaking would be placed into new flasks.

Table 4.3–6. Maximum Estimated Mercury Exposures Associated with Normal Operations Under the Consolidated Storage Alternative

Consolidated Storage Location	Mercury Release Concentration	Distance of Receptor from Release Point	Maximum Exposure to Both Onsite Workers and the Public
New Haven Depot	25,000 ng/m^3	492 ft	43 ng/m^3
Somerville Depot	25,000 ng/m^3	328 ft	90 ng/m^3
Warren Depot	25,000 ng/m^3	197 ft/394ft[a]	138 ng/m^3/68 ng/m^3[a]
Hawthorne Army Depot	25,000 ng/m^3	12,140 ft	1 ng/m^3
PEZ Lake Development	25,000 ng/m^3	594 ft	32 ng/m^3
Utah Industrial Depot	25,000 ng/m^3	1,332 ft	0.6 ng/m^3

[a] Maximum estimated exposure at the Warren Depot would be 138 ng/m^3 at 197 ft from the release for workers, and 68 ng/m^3 at 394 ft from the release for the public.

Source: DLA 2003:Table 4-1.

Human health and ecological risks associated with soil contamination attributable to mercury released during normal operations are also considered negligible because any mercury released to the atmosphere would be in the form of elemental mercury. Elemental mercury has been found not to deposit near its source (up to distances of about 6 mi [9.6 km]), and given the extremely small amount of mercury that would be released from the consolidated storage location during normal operations, it would be indistinguishable from background mercury concentrations beyond that distance (DLA 2003:4-2).

4.3.5 Human Health and Ecological Risk from Facility Accidents

The potential accident scenarios and consequence levels for each storage location considered under the Consolidated Storage Alternative are the same as those for the No Action Alternative discussed in Section 4.2.1.5: single flask spill, single pallet spill, earthquake spill, and forklift fuel fire. However, because risk is expressed as a function of the frequency of occurrence of an accident and the magnitude of the consequences, relocation of the mercury stockpile would be a source of additional risks. When compared to the No Action Alternative, the Consolidated Storage Alternative represents an increased potential for accidental releases of mercury from the stockpile (from accidents other than earthquakes) due to the higher level of handling and shipping activity that would be required (DLA 2003:1-5). The frequency of occurrence of the single flask spill would remain within the moderate category for each storage location considered under the Consolidated Storage Alternative. However, for the single pallet spill, the frequency would increase to high, because of the additional activity required to load the pallets onto either a truck or a railcar at the originating location and to unload the pallets at the destination. The

[4] Consolidated storage at the Hawthorne Army Depot could occur using either storage buildings or igloos. Periodic inspections of igloos would be more time consuming because 125 igloos would need to be visited instead of 20 storage buildings. Inspection and reflasking during the last year of the 40-year storage period would be more difficult and time consuming for the same reason. The increased time that the workers would spend around the mercury is likely to increase their exposure to very low levels of mercury vapors; however, no discernable increase in adverse affects is expected.

frequency of the forklift fuel fire also increases to low. For the earthquake, the frequency of occurrence is moderate. The failure rate would remain the same as for the No Action Alternative (estimated to be 5 percent), but the consequences would increase because there would be more drums stored in one location (DLA 2003:2-3, 2-7, 2-20, 2-21).[5]

The methodology derived from EPA risk assessment guidance specifies that if either the frequency of occurrence or the severity of the consequence is negligible, the risk is determined to be correspondingly negligible (DLA 2003:1-4). Therefore only the risk associated with the forklift fuel fire for the involved worker increases from that indicated in Table 4.2–1, from negligible to moderate. In addition, the forklift fuel fire is considered a very conservative assessment because the worker is exposed for only 10 seconds, whereas the benchmark applies to a 30-minute exposure (DLA 2003:4-7).

The risk from a forklift fire to each of the ecological receptors identified in Table 4.2–2 is shown in Table 4.3–7. This risk is based on the consequence levels in Table 4.2–2 and the frequency of forklift fires, categorized as low.

Table 4.3–7. Risk Levels for Exposure of Ecological Receptors to Mercury After an Onsite Forklift Fire[a]

Receptor	Medium	Dry Deposition[b]		Wet Deposition[c]	
		Inorganic Mercury	Methyl Mercury	Inorganic Mercury	Methyl Mercury
Plants	Dry soil	Low	NA	Low	NA
Soil invertebrates	Dry soil	Low	Negligible	Moderate	Negligible
Short-tailed shrew	Dry soil	Negligible	Negligible	Negligible	Negligible
American robin	Dry soil	Negligible	Negligible	Low	Low
Red-tailed hawk	Dry soil	Negligible	Negligible	Negligible	Negligible
Plants	Wetland soil	Low	NA	Low	NA
Soil invertebrates	Wetland soil	Low	Negligible	Moderate	Negligible
Short-tailed shrew	Wetland soil	Negligible	Negligible	Negligible	Low
American robin	Wetland soil	Negligible	Low	Low	Moderate
Red-tailed hawk	Wetland soil	Negligible	Negligible	Negligible	Negligible
Benthic invertebrates	Sediment	Low	NA	Moderate	NA
Great blue heron	Sediment	Negligible	Negligible	Negligible	Negligible
Aquatic biota	Surface water	Negligible	Low	Negligible	Low
Great blue heron	Surface water	Negligible	Negligible	Negligible	Low

[a] Risk levels are defined in Table 4.1–3.
[b] Dry deposition and concentrations of divalent mercury at 1,641 ft (500 m) downwind (maximum concentration deposited).
[c] Wet deposition and concentrations of divalent mercury at 328 ft (100 m) downwind (maximum concentration deposited).
Key: NA, not applicable.
Source: DLA 2003:Table 5-5.

[5] Consolidated storage at Hawthorne Army Depot could occur using either storage buildings or storage igloos. Storage of mercury in igloos would result in additional handling. Increased handling of the mercury would likely increase the risks of an accident, but not substantially. Because the igloos are constructed of steel-reinforced concrete and capped with approximately 2 ft (0.6 m) of soil, the mercury would be better protected from natural hazards (such as high winds, tornadoes, and snow loads) and vehicle crashes, including small aircraft crashes. Therefore, the risks of these types of accidents may be slightly lower for the storage of mercury in igloos.

Note that moderate ecological risk levels occur only for wet deposition (that is, if it is raining during the fire). Because the simultaneous occurrence of a fire and rainfall for the duration of the fire is much less likely than either event alone, the frequency of wet deposition after a fire is lower than the frequency of fires assumed in the analysis. If it is assumed that wet deposition can occur only 10 percent of the time, the frequency of wet deposition after a forklift fire would be negligible rather than low. The frequency of deposition to a wetland or pond is even smaller than the frequency of deposition to dry soil because the wetland or pond would have to lie downwind from the fire, and it is unlikely that the wind blows continuously from the storage facility directly over a wetland or pond. Therefore, the conclusion that wet deposition after a fire results in moderate ecological risk is an extremely conservative conclusion.

In addition, risks are evaluated at the maximum modeled soil concentration. The soil concentration after wet deposition would be expected to decrease rapidly with distance downwind from the maximum location. That means that even if a fire and rain occurred at the same time, moderate risk to soil invertebrates in dry soil and wetland soil would occur for less than 1,640 ft (500 m) downwind. Moderate risks for songbirds like the American robin from deposition to wetland soil would be limited to the first 3,281 ft (1,000 m) downwind. For benthic invertebrates a moderate risk would result only if the pond where mercury is deposited is less than approximately 3,281 ft (1,000 m) downwind, and for aquatic biota, the pond would have to be less than 656 ft (200 m) to 984 ft (300 m) from the fire.

Concentrations also decrease rapidly with distance from the centerline of the deposition zone, so the physical area that would be contaminated above a moderate risk level is small. The low to negligible probability that a fire would occur while it is raining and the small area potentially affected, together with the negligible risk from spills without a fire, suggest that the ecological impact of potential accidents at the consolidated storage facility would be very small (DLA 2003:5-11).

4.3.6 Transportation

Under the Consolidated Storage Alternative, mercury would be moved by truck or rail from three existing storage locations to a fourth existing storage location, or from all four storage locations to a new location (the Hawthorne Army Depot, the PEZ Lake Development, or the Utah Industrial Depot). Transportation risks for the Consolidated Storage Alternative are based on the estimated number of truckloads and/or railcar loads needed to effect the transfer of mercury to a single location, and the total mileage resulting from these trips. Table 4.3–8 presents the required number of truck or railcar shipments and the approximate highway miles or rail miles that would be associated with each consolidated storage location. The estimated frequency of both truck and rail accidents with a mechanically induced fatality or a fire with a release of mercury is low. The estimated frequency of truck and rail accidents with a mercury spill but no fire is moderate. The potential for a truck or railcar spill directly into a waterbody was determined to be negligible (DLA 2003:2-15, 2-21).

Table 4.3–8. Transportation Requirements Under the Consolidated Storage Alternative

Consolidated Storage Location	Truck Shipments[a]	Highway Miles[b]	Rail Shipments[a]	Rail Miles[b]
New Haven Depot	268	141,533	134	88,128
Somerville Depot	126	72,718	63	45,689
Warren Depot	267	104,536	134	70,015
Hawthorne Army Depot[c]	308	770,816	156	414,849
PEZ Lake Development	308	117,400	156	75,634
Utah Industrial Depot	308	616,478	156	351,373

[a] Appendix C, Tables C-1 and C-2.

[b] DLA 2003:Table 2-3.

[c] Consolidated storage at Hawthorne Army Depot could occur using either storage buildings or storage igloos. Because rail lines do not come directly to the storage igloos, additional truck trips would be needed to move the mercury from the rail line to the storage igloos. This would amount to an average of four truck trips (maximum of eight) per day during the approximately 90 days it would take to move the mercury to the Hawthorne Army Depot (see Appendix C). These trucks would travel only the short distance between the onsite rail line and the storage igloos. Because the route the trucks would take is entirely on site, major impacts on traffic and the transportation infrastructure are not expected. Assuming that 14 pallets (420 flasks) can be loaded on each truck, and 128,662 flasks need to be moved, 308 truck trips would be needed to move the mercury.

Tables 4.3–9 and 4.3–10 present consequences and risks to humans from truck and railcar fire scenarios for chronic and acute health effects, respectively. The railcar or truck fire scenario postulates the release of mercury into the atmosphere over a fire duration of approximately 12 minutes for the truck fire and 22 minutes for the railcar fire, with subsequent transport downwind. As for onsite fires, concentrations are projected for a range of distances from the source of contamination and are therefore applicable to any accident location. Elemental mercury released as a result of the accident is expected to remain airborne rather than deposit locally. Divalent mercury formed in fire scenarios is expected to deposit locally, either as a result of dry deposition or rainfall scavenging (i.e., wet deposition). Once deposited, the mercury is expected to mix completely with the top 2 in (5 cm) of soil (DLA 2003:4-9). As can be seen in Table 4.3–9, risk levels for chronic effects from offsite truck or rail fires are negligible for dry deposition and low for wet deposition. For the truck fire, the peak concentration for dry deposition is 0.94 mg/kg and occurs at 6,946 ft (2,117 m) from the release, and is well below the benchmark level of 23 mg/kg. For wet deposition, the peak concentration estimated at 328 ft (100 m) is 53 mg/kg. The furthest downwind distance at which the soil criteria are exceeded, for wet deposition is 761 ft (232 m).

Table 4.3–9. Exposure Point Concentrations for Soil Deposition During Offsite Truck and Rail Fires (Chronic Health Effects)

Event	Deposition Type	Maximum EPC in Soil (mg/kg)	Benchmark (mg/kg)	Ratio[a]	Consequence Level[b]	Frequency[c]	Risk Level[d]
Truck fire	Dry	0.94	23	0.04	Negligible	Low	Negligible
	Wet	53	23	2.3	Moderate	Low	Low
Rail fire	Dry	0.94	23	0.04	Negligible	Low	Negligible
	Wet	61.5	23	2.67	Moderate	Low	Low

[a] Ratio of EPC/Benchmark level.

[b] Consequence levels correspond to the following ratios of EPC/Benchmark: >10, high; >1 and ≤10, moderate; >0.1 and ≤1, low; ≤0.1, negligible.

[c] Frequency categories are defined in Table 4.1–2.

[d] Risk level, as defined in Table 4.1–3, is a function of consequence level range and frequency range.

Key: EPC, exposure point concentration.

Source: DLA 2003:Tables 4-10 and 4-12.

Table 4.3–10 indicates that the risk of acute human health effects from this scenario is low for both truck and rail transport. The maximum predicted airborne concentration of mercury is 2.27 mg/m^3 at 7,090 ft (2,162 m) from the truck fire. For the railcar fire, the maximum predicted airborne concentration is 2.41 mg/m^3 at a distance of 7,520 ft (2,281 m).

Table 4.3–10. Exposure Point Concentrations in Air for Offsite Truck and Rail Fires (Acute Health Effects)

Event	Receptor	Receptor Location (ft)	EPC (mg/m^3)	Benchmark (mg/m^3)	Ratio[a]	Consequence Level[b]	Frequency[c]	Risk Level[d]
Truck fire	Offsite worker	7,090	2.27	10	0.2	Low	Low	Low
	Public	7,090	2.27	1.67	1.4	Moderate	Low	Low
Rail fire	Offsite worker	7,520	2.41	10	0.2	Low	Low	Low
	Public	7,520	2.41	1.67	1.4	Moderate	Low	Low

[a] Ratio of EPC/Benchmark level.
[b] Consequence levels correspond to the following ratios of EPC/Benchmark: >10, high; >1 and ≤10, moderate; >0.1 and ≤1, low; ≤0.1, negligible.
[c] Frequency levels are defined in Table 4.1–2.
[d] Risk level, as defined in Table 4.1–3, is a function of consequence level range and frequency range.
Key: EPC, exposure point concentration.
Source: DLA 2003:Tables 4-9, 4-13.

For airborne exposures occurring from a spill with no fire during a transportation accident, it is assumed that about 25 percent of the mercury would be released. This release is equivalent to 105 flasks of mercury per truckload (7,980 lb [3,620 kg]) or 210 flasks per railcar (16,000 lb [7,258 kg]). As shown in Table 4.3–11, the consequences in the immediate area of the spill and for receptors 328 ft (100 m) downwind fall well below their respective benchmarks. Therefore, the acute human health risk from spills occurring during transportation is negligible. Because the mercury vapor evaporating from a spill remains elemental and does not deposit on the ground, there is no local chronic exposure pathway.

Table 4.3–11. Exposure Point Concentrations in Air for Offsite Truck and Rail Spills Without Fire (Acute Health Effects)

Event	EPC in Immediate Area (mg/m^3)	IDLH Ratio	EPC at 100 m Downwind (mg/m^3)	ERPG-2 Ratio	Consequence Level[a]	Frequency[b]	Risk Level[c]
Truck spill	1.55	0.16	0.0649	0.06	Negligible	Moderate	Negligible
Rail spill	2.19	0.22	0.0914	0.09	Negligible	Moderate	Negligible

[a] Consequence levels correspond to the following ratios of EPC/Benchmark: >10, high; >1 and ≤10, moderate; >0.1 and ≤1, low; ≤0.1, negligible.
[b] Frequency categories are defined in Table 4.1–2.
[c] Risk level, as defined in Table 4.1–3, is a function of consequence level range and frequency range.
Key: EPC, exposure point concentration; ERPG, emergency response planning guideline; IDLH, immediately dangerous to life or health.
Source: DLA 2003:Table 4-14.

Ecological risks associated with the Consolidated Storage Alternative after a transportation accident arise from the vaporization of spilled mercury or the deposition downwind on soil or wetland sediments after a fire. Thus, inhalation, direct contact, and ingestion by ecological receptors could be of concern for either the truck or railcar accident scenarios. For a spill, rapid cleanup is expected so that the only mercury released would be elemental, and the inhalation route would be a minor exposure pathway relative to ingestion. Thus, the ecological risks are considered to be negligible for a transportation spill unless there is also a fire (DLA 2003:5-12). Exposure concentration, benchmark ratios, and consequence levels for ecological receptors exposed to divalent mercury after a truck fire during transport are shown in Table 4.3–12.

Table 4.3–12. Exposure Concentrations, Consequence Levels for Ecological Receptors Exposed to Mercury from a Truck Fire

			Dry Deposition[a]		Wet Deposition[b]	
Receptor	**Medium**	**Parameter**	**Inorganic Mercury**	**Methyl Mercury**	**Inorganic Mercury**	**Methyl Mercury**
Plants	Dry soil (mg/kg)	Concentration	0.922	0.019	51.918	1.060
		Benchmark	0.3	None	0.3	None
		Ratio[c]	3.073	NA	173.061	NA
		Consequence level[d]	Low	NA	High	NA
Soil invertebrates	Dry soil (mg/kg)	Concentration	0.922	0.019	51.918	1.060
		Benchmark	0.1	2.5	0.1	2.5
		Ratio	9.22	0.008	519.2	0.424
		Consequence level	Low	Negligible	High	Negligible
Short-tailed shrew	Dry soil (mg/kg)	Concentration	0.922	0.019	51.918	1.060
		Benchmark	110	0.08	110	0.08
		Ratio	0.008	0.235	0.472	13.245
		Consequence level	Negligible	Negligible	Negligible	Moderate
American robin	Dry soil (mg/kg)	Concentration	0.922	0.019	51.918	1.060
		Benchmark	2	0.01	2	0.01
		Ratio	0.461	1.880	25.96	106.0
		Consequence level	Negligible	Low	High	High
Red-tailed hawk	Dry soil (mg/kg)	Concentration	0.922	0.019	51.918	1.060
		Benchmark	1619	6.86	1619	6.86
		Ratio	0.0006	0.003	0.032	0.154
		Consequence level	Negligible	Negligible	Negligible	Negligible
Plants	Wetland soil (mg/kg)	Concentration	0.800	0.141	45.031	7.947
		Benchmark	0.3	None	0.3	None
		Ratio	2.665	NA	150.103	NA
		Consequence level	Low	NA	High	NA
Soil invertebrates	Wetland soil (mg/kg)	Concentration	0.800	0.141	45.031	7.947
		Benchmark	0.1	2.5	0.1	2.5
		Ratio	7.995	0.056	450.3	3.18
		Consequence level	Low	Negligible	High	Low
Short-tailed shrew	Wetland soil (mg/kg)	Concentration	0.800	0.141	45.031	7.947
		Benchmark	110	0.08	110	0.08
		Ratio	0.007	1.764	0.409	99.334
		Consequence level	Negligible	Low	Negligible	High

Receptor	Medium	Parameter	Dry Deposition[a] Inorganic Mercury	Dry Deposition[a] Methyl Mercury	Wet Deposition[b] Inorganic Mercury	Wet Deposition[b] Methyl Mercury
American robin	Wetland soil (mg/kg)	Concentration	0.800	0.141	45.031	7.947
		Benchmark	2	0.01	2	0.01
		Ratio	0.400	14.110	22.516	795
		Consequence level	Negligible	Moderate	High	High
Red-tailed hawk	Wetland soil (mg/kg)	Concentration	0.800	0.141	45.031	7.947
		Benchmark	1619	6.86	1619	6.86
		Ratio	0.0005	0.021	0.028	1.158
		Consequence level	Negligible	Negligible	Negligible	Low
Benthic invertebrates	Sediment (mg/kg)	Concentration	1.999	0.353	112.578	19.867
		Benchmark	0.150	None	0.150	None
		Ratio	13.325	NA	750.517	NA
		Consequence level	Moderate	NA	High	NA
Great blue heron	Sediment (mg/kg)	Concentration	1.999	0.353	112.578	19.867
		Benchmark	736	2.09	736	2.09
		Ratio	0.003	0.169	0.153	9.506
		Consequence level	Negligible	Negligible	Negligible	Low
Aquatic biota	Surface water (mg/l)	Concentration	2.82×10^{-3}	1.31×10^{-2}	1.59×10^{-1}	7.36×10^{-1}
		Benchmark	1.300	0.003	1.300	0.003
		Ratio	0.002	4.679	0.122	262.857
		Consequence level	Negligible	Low	Negligible	High
Great blue heron	Surface water (mg/l)	Concentration	2.82×10^{-3}	1.31×10^{-2}	1.59×10^{-1}	7.36×10^{-1}
		Benchmark	1.400	0.032	1.400	0.032
		Ratio	0.0020	0.409	0.114	23.000
		Consequence level	Negligible	Negligible	Negligible	High

[a] Dry deposition and concentrations of divalent mercury at 6,562 ft (2,000 m) downwind (maximum concentration deposited).

[b] Wet deposition and concentrations of divalent mercury at 328 ft (100 m) downwind (maximum concentration deposited).

[c] Ratio for dry deposition is concentration at 6,562 ft (2,000 m) downwind/Benchmark. Ratio for wet deposition is concentration at 328 ft/Benchmark.

[d] Consequence levels for ecological receptors correspond to the following ratios: ≥20, high; >10 and <20, moderate; >1 and <10, low; <1, negligible.

Key: NA, not applicable.

Source: DLA 2003:Table 5-7.

Table 4.3–13 indicates the risk levels for ecological receptors exposed to mercury after a truck fire. The risk levels are based on the consequences identified in Table 4.3–12 and the low predicted frequency of a truck fire under the Consolidated Storage Alternative.

Table 4.3–13 shows that moderate risk results from wet deposition of inorganic mercury on dry and wetland soil for plants, soil invertebrates, and the American robin and in sediment for benthic organisms. Moderate risk also results for wet deposition of methyl mercury on dry and wetland soil for the American robin; for wetland soil for the short-tailed shrew; and for surface water for aquatic biota and the great blue heron (DLA 2003:5-14). Tables 4.3–14 and 4.3–15 present similar information for railcar fire scenarios.

Table 4.3–13. Risk Levels for Exposure of Ecological Receptors to Mercury after a Truck Fire[a]

		Dry Deposition[b]		Wet Deposition[c]	
Receptor	**Medium**	**Inorganic Mercury**	**Methyl Mercury**	**Inorganic Mercury**	**Methyl Mercury**
Plants	Dry soil	Low	NA	Moderate	NA
Soil invertebrates	Dry soil	Low	Negligible	Moderate	Negligible
Short-tailed shrew	Dry soil	Negligible	Negligible	Negligible	Low
American robin	Dry soil	Negligible	Low	Moderate	Moderate
Red-tailed hawk	Dry soil	Negligible	Negligible	Negligible	Negligible
Plants	Wetland soil	Low	NA	Moderate	NA
Soil invertebrates	Wetland soil	Low	Negligible	Moderate	Low
Short-tailed shrew	Wetland soil	Negligible	Low	Negligible	Moderate
American robin	Wetland soil	Negligible	Low	Moderate	Moderate
Red-tailed hawk	Wetland soil	Negligible	Negligible	Negligible	Low
Benthic invertebrates	Sediment	Low	NA	Moderate	NA
Great blue heron	Sediment	Negligible	Negligible	Negligible	Low
Aquatic biota	Surface water	Negligible	Low	Negligible	Moderate
Great blue heron	Surface water	Negligible	Negligible	Negligible	Moderate

[a] Risk levels are defined in Table 4.1–3.
[b] Dry deposition and concentrations of divalent mercury at 6,562 ft (2,000 m) downwind (maximum concentration deposited).
[c] Wet deposition and concentrations of divalent mercury at 328 ft (100 m) downwind (maximum concentration deposited).
Key: NA, not applicable.
Source: DLA 2003:Table 5-8.

Table 4.3–14. Exposure Concentrations, Consequence Levels for Ecological Receptors Exposed to Mercury from a Railcar Fire

			Dry Deposition[a]		Wet Deposition[b]	
Receptor	**Medium**	**Parameter**	**Inorganic Mercury**	**Methyl Mercury**	**Inorganic Mercury**	**Methyl Mercury**
Plants	Dry soil (mg/kg)	Concentration	0.968	0.020	60.234	1.229
		Benchmark	0.3	None	0.3	None
		Ratio[c]	3.228	NA	200.779	NA
		Consequence level[d]	Low	NA	High	NA
Soil invertebrates	Dry soil (mg/kg)	Concentration	0.968	0.020	60.234	1.229
		Benchmark	0.1	2.5	0.1	2.5
		Ratio	8.399	0.059	602.338	0.49
		Consequence level	Low	Negligible	High	Negligible
Short-tailed shrew	Dry soil (mg/kg)	Concentration	0.968	0.020	60.234	1.229
		Benchmark	110	0.08	110	0.08
		Ratio	0.019	4.631	1.187	288.109
		Consequence level	Negligible	Low	Low	High
American robin	Dry soil (mg/kg)	Concentration	0.968	0.020	60.234	1.229
		Benchmark	2	0.01	2	0.01
		Ratio	0.484	1.980	30.117	122.930
		Consequence level	Negligible	Low	High	High

Receptor	Medium	Parameter	Dry Deposition[a]		Wet Deposition[b]	
			Inorganic Mercury	**Methyl Mercury**	**Inorganic Mercury**	**Methyl Mercury**
Red-tailed hawk	Dry soil (mg/kg)	Concentration	0.968	0.020	60.234	1.229
		Benchmark	1619	6.86	1619	6.86
		Ratio	0.0006	0.003	0.037	0.179
		Consequence level	Negligible	Negligible	Negligible	Negligible
Plants	Wetland soil (mg/kg)	Concentration	0.840	0.148	52.244	9.220
		Benchmark	0.30	None	0.3	None
		Ratio	2.800	NA	174.145	NA
		Consequence level	Low	NA	High	NA
Soil invertebrates	Wetland soil (mg/kg)	Concentration	0.840	0.148	52.244	9.220
		Benchmark	0.1	2.5	0.1	2.5
		Ratio	8.399	0.059	522.436	3.688
		Consequence level	Low	Negligible	High	Low
Short-tailed shrew	Wetland soil (mg/kg)	Concentration	0.840	0.148	52.244	9.220
		Benchmark	110	0.08	110	0.080
		Ratio	0.008	1.853	0.475	115.244
		Consequence level	Negligible	Low	Negligible	High
American robin	Wetland soil (mg/kg)	Concentration	0.840	0.148	52.244	9.220
		Benchmark	2	0.01	2	0.01
		Ratio	0.420	14.820	26.122	921.950
		Consequence level	Negligible	Moderate	High	High
Red-tailed hawk	Wetland soil (mg/kg)	Concentration	0.840	0.148	52.244	9.220
		Benchmark	1619	6.86	1619	6.86
		Ratio	0.0005	0.022	0.032	1.344
		Consequence level	Negligible	Negligible	Negligible	Low
Benthic invertebrates	Sediment (mg/kg)	Concentration	2.100	0.371	130.609	23.049
		Benchmark	0.15	None	0.15	None
		Ratio	13.998	NA	870.727	NA
		Consequence level	Moderate	NA	High	NA
Great blue heron	Sediment (mg/kg)	Concentration	2.100	0.371	130.609	23.049
		Benchmark	736	2.09	736	2.09
		Ratio	0.003	0.177	0.177	11.028
		Consequence level	Negligible	Negligible	Negligible	Moderate

Receptor	Medium	Parameter	Dry Deposition[a] Inorganic Mercury	Dry Deposition[a] Methyl Mercury	Wet Deposition[b] Inorganic Mercury	Wet Deposition[b] Methyl Mercury
Aquatic biota	Surface water (mg/l)	Concentration	2.96×10^{-3}	1.37×10^{-2}	1.84×10^{-1}	8.54×10^{-1}
		Benchmark	1.3	0.003	1.3	0.003
		Ratio	0.0023	4.893	0.142	305.000
		Consequence level	Negligible	Low	Negligible	High
Great blue heron	Surface water (mg/l)	Concentration	2.96×10^{-3}	1.37×10^{-2}	1.84×10^{-1}	8.54×10^{-1}
		Benchmark	1.4	0.032	1.4	0.032
		Ratio	0.002	0.428	0.131	26.688
		Consequence level	Negligible	Negligible	Negligible	High

[a] Dry deposition and concentrations of divalent mercury at 6,562 ft (2,500 m) downwind (maximum concentration deposited).

[b] Wet deposition and concentrations of divalent mercury at 328 ft (100 m) downwind (maximum concentration deposited).

[c] Ratio for dry deposition is concentration at 6,562 ft (2,000 m) downwind/Benchmark. Ratio for wet deposition is concentration at 328 ft/Benchmark.

[d] Consequence levels for ecological receptors correspond to the following ratios: ≥20, high; >10 and <20, moderate; >1 and <10, low; <1, negligible.

Key: NA, not applicable.

Source: DLA 2003:Table 5-10.

Table 4.3–15 shows that moderate risk results from wet deposition of inorganic mercury on dry and wetland soil for plants, soil invertebrates, and the American robin and in sediment for benthic invertebrates. Moderate risk also results for wet deposition of methyl mercury on wetland soil for the short-tailed shrew and dry and wetland soil for the American robin; and for surface water for aquatic biota and the great blue heron (DLA 2003:5-18).

Moderate risk levels occur only for wet deposition (that is, if it is raining during the fire). Because the simultaneous occurrence of a fire and rainfall for the duration of the fire is much less likely than either event alone, the frequency of wet deposition after a fire is lower than assumed in the analysis. If it is assumed that wet deposition can occur only 10 percent of the time, the frequency of wet deposition after a truck or railcar crash with fire would be negligible for deposition to dry soil. The frequency of deposition to a wetland or pond is even less than the frequency of deposition to dry soil because the wetland or pond would have to lie downwind from the fire, and it is not certain that the wind would be blowing from the accident site directly over a wetland or pond. Therefore, although exposures would be high in the event of deposition to a wetland or pond, the low probability of the event makes it unlikely that harm would result from truck or rail transportation under the Consolidated Storage Alternative. Therefore, the conclusion that moderate ecological risk levels would result from wet deposition after a fire is an extremely conservative conclusion (DLA 2003:5-15, 5-16).

In addition, risks were evaluated at the maximum modeled soil concentration. However, the soil concentration after wet deposition would be expected to decrease with distance downwind from the maximum location, thereby likely overstating the predicted risk. For wet deposition to dry soil, a moderate risk level for soil invertebrates is predicted to exist for more than 16,405 ft (5,000 m) downwind. For other receptors, the distances would be lower (for example, about 8,202 ft [2,500 m] for plants and 4,922 ft [1,500 m] for songbirds). In the case of wet deposition to ponds and wetlands, however, moderate risk levels would occur for several thousand meters downwind from the truck fire (DLA 2003:5-16).

Table 4.3–15. Risk Levels for Exposure of Ecological Receptors to Mercury after a Railcar Fire[a]

Receptor	Medium	Dry Deposition[b]		Wet Deposition[c]	
		Inorganic Mercury	Methyl Mercury	Inorganic Mercury	Methyl Mercury
Plants	Dry soil	Low	NA	Moderate	NA
Soil invertebrates	Dry soil	Low	Negligible	Moderate	Negligible
Short-tailed shrew	Dry soil	Negligible	Low	Low	Low
American robin	Dry soil	Negligible	Low	Moderate	Moderate
Red-tailed hawk	Dry soil	Negligible	Negligible	Negligible	Negligible
Plants	Wetland soil	Low	NA	Moderate	NA
Soil invertebrates	Wetland soil	Low	Negligible	Moderate	Low
Short-tailed shrew	Wetland soil	Negligible	Low	Negligible	Moderate
American robin	Wetland soil	Negligible	Low	Moderate	Moderate
Red-tailed hawk	Wetland soil	Negligible	Negligible	Negligible	Low
Benthic invertebrates	Sediment	Low	NA	Moderate	NA
Great blue heron	Sediment	Negligible	Negligible	Negligible	Low
Aquatic biota	Surface water	Negligible	Low	Negligible	Moderate
Great blue heron	Surface water	Negligible	Negligible	Negligible	Moderate

[a] Risk levels are defined in Table 4.1–3.
[b] Dry deposition and concentrations of divalent mercury at 8,200 ft (2,500 m) downwind (maximum concentration deposited).
[c] Wet deposition and concentrations of divalent mercury at 328 ft (100 m) downwind (maximum concentration deposited).
Key: NA, not applicable.
Source: DLA 2003:Table 5-11.

For railcar accidents, if a fire and rain occurred at the same time, moderate risk levels for soil invertebrates in dry soil and wetland soil would occur for nearly 32,810 ft (10,000 m) downwind. Moderate risk levels for songbirds like the American robin would be limited to the first 4,922 ft (1,500 m) downwind for deposition to dry soil. For benthic invertebrates, moderate risk levels would also result if the pond where mercury is deposited is less than 32,810 ft (10,000 m) downwind (DLA 2003:5-19).

The low-to-negligible probability that a fire would occur while it is raining and the limited area involved, together with the negligible risk from spills without a fire, suggest that the ecological impact of transportation accidents for the Consolidated Storage Alternative is not likely to be of concern (DLA 2003:5-16, 5-20).

4.3.7 Geology and Soils

Consolidated storage of mercury should have no impact on geology and soils as no new construction or other ground-disturbing activity is anticipated to be required.

Hazards from geologic conditions (e.g., earthquakes) were evaluated and discussed in Section 4.2 for the New Haven, Somerville, and Warren depots, and were found to present a relatively low risk to existing depot activities. Similarly, existing geologic and soil conditions would not be expected to pose a threat to proposed consolidated storage operations.

In general, the potential for geologic conditions to affect existing depot facilities at the Hawthorne Army Depot is moderate to high compared to other locations. The Hawthorne Army Depot is located in a region of high seismicity near known, active faults, although no depot facilities have suffered structural damage due to earthquakes during over 60 years of operations. Large earthquakes have historically produced ground motion effects up to MMI X in Mineral County (see Appendix E, Table E–11). The predicted peak ground acceleration at the site from an earthquake with an annual probability of occurrence of 1 in 2,500 is 0.67g. A major earthquake producing such ground shaking could cause substantial damage to even specially designed structures while destroying ordinary buildings of masonry or frame construction. However, the construction of the structures that would be used for mercury storage is particularly unique in that the facilities are constructed of reinforced concrete and designed to be resistant to accidental detonation of ammunition. Such facilities would be unlikely to collapse or be destroyed by the maximum considered earthquake ground motion at the site. Thus, such ground motion and modest structural damage to the storage buildings would be unlikely to cause a breach in the steel drum overpacks and in the steel mercury flasks contained within them.

At PEZ Lake Development, the potential for geologic conditions to affect existing site facilities is low. West-central New York and the Seneca County region has a relatively negligible seismicity overall, although the region is not free of all seismic hazard. Earthquakes have historically produced ground motion effects equivalent to MMI VII in the state (see Appendix E, Table E–11). The predicted peak ground acceleration at the site from an earthquake with an annual probability of occurrence of 1 in 2,500 is 0.09g. While widely felt, damage from such an event would likely be negligible to slight to ordinary structures with little potential for damage to well designed or specially designed and constructed facilities.

At the Utah Industrial Depot, the potential for geologic conditions to affect existing depot facilities is generally moderate due to regional seismic activity. The depot is located between two active faults capable of producing strong magnitude earthquakes (i.e., greater than magnitude 6.0) with MMI's of at least VIII. So far, earthquakes have historically only produced ground motion effects up to MMI V to VI in the Tooele area associated with earthquakes with magnitudes up to 5.2 (see Appendix E, Table E–11). The predicted peak ground acceleration at the site from an earthquake with an annual probability of occurrence of 1 in 2,500 is 0.34g. Such earthquake ground shaking would be strongly felt and could cause slight to moderate damage to well-built, ordinary structures with negligible damage to well designed or specially designed and constructed facilities. This ground motion and modest structural damage to the storage building would be unlikely to cause a breach in the steel drum overpacks and in the steel mercury flasks contained within them. Thus, consolidated storage at each location is neither expected to impact geologic or soil resources, nor be jeopardized by geologic conditions.

4.3.8 Water Resources

Personnel performing mercury management activities at each consolidated storage location would use approximately 10,800 gal/yr (40,882 l/yr) of water. For the Somerville and Warren depots, PEZ Lake Development, and Utah Industrial Depot, it is expected that this water requirement would be met by the municipal water supply systems that currently serve them. Hawthorne Army Depot operates its own water supply and distribution system that relies on surface water runoff supplemented by groundwater. Only the New Haven Depot uses groundwater directly and exclusively as a source of water supply. Although the Somerville Depot obtains its water supply from a municipal system that primarily relies on surface water sources, the depot is located above a designated sole-source aquifer, the Fifteen Basin Aquifer Systems of northwest New Jersey. Nevertheless, even if new employees were hired for mercury management functions, water use requirements would not exceed the available site water capacity, resulting in a negligible to minor impact on water supply availability for other users. Also, sanitary wastewater would be collected and treated by existing sanitary sewer and/or septic systems that serve each consolidated storage location, all of which have sufficient capacity.

Transportation of the mercury flasks from their current storage locations to each location considered under the Consolidated Storage Alternative is not anticipated to have any impact on water resources. All transfer, staging, loading, and unloading activities would be conducted in accordance with best management practices for mercury handling. Specifically, safeguards would include adherence to the updated SPCC and ISC Plans and governing DNSC procedures that address such elements as shipping package integrity, forklift operations, materials and equipment safety, as well as spill prevention and release response. Shipping to each consolidated storage location would be subject to applicable U.S. Department of Transportation hazardous materials regulations. During transport, there would be no liquid or airborne mercury emissions. An analysis of potential environmental consequences resulting from transportation accidents is presented in Section 4.3.6.

Mercury management activities at each consolidated storage location would generally be conducted in accordance with DNSC-approved work practices, plans, and procedures to include periodic visual inspections of mercury storage locations and mercury vapor monitoring for the purposes of leak detection. Mercury flasks would be stored in overpack drums (grouped in drip pans on wooden pallets) within the warehouses that have sealed, concrete flooring (see Appendix C, Table C–2). Also, adequate structural controls such as the use of containment systems would continue to be employed to ensure that spills or leaks, should they occur, do not reach soils or surfaces where they could be conveyed to surface waters or groundwater. Thus, no impacts on surface water or groundwater quality would be expected at any consolidated storage site under normal operations, including no impacts on the Fifteen Basin Aquifer Systems of northwest New Jersey should the Somerville Depot be selected as the consolidated storage site. Existing facility plans would be updated and expanded as necessary to address spill prevention, response, and cleanup activities for mercury and other emergency response procedures, such as for fire or explosion, that could otherwise affect mercury storage locations. Plans would also be reviewed and expanded as necessary to ensure that contact between storm water runoff and pollutants, including mercury, is minimized. An analysis of potential environmental consequences resulting from storage facility accidents is present in Section 4.3.5.

DNSC will open and inspect the interior of each overpack for leaks during the last year of storage. Any flasks found to have leaked would be reflasked and the overpacks containing them cleaned and resealed. Mercury-contaminated wastes generated as a result of reflasking would be properly managed. These measures would help ensure that no release could reach surface water or groundwater.

4.3.9 Ecological Resources

The Consolidated Storage Alternative would involve only minor, short-term building modification at the Somerville Depot, Hawthorne Army Depot, PEZ Lake Development, and Utah Industrial Depot. No new construction would be required at any of the consolidated storage locations. The increase in traffic to move the mercury from the other depots to the consolidated storage location would also be negligible to minor. Therefore, negligible or no impacts on ecological resources, including terrestrial and aquatic resources, wetlands, and threatened and endangered species, are anticipated. Sections 4.3.4, 4.3.5, and 4.3.6 describe potential ecological risks from normal operations, facility accidents, and transportation, respectively.

4.3.10 Cultural Resources

Consolidated mercury storage would not involve ground disturbance at any of the consolidated storage locations. Two locations under consideration have a number of buildings that are eligible for inclusion on the National Register of Historic Places (NRHP) (see Sections 3.6.8 and 3.8.8). However, the use of NRHP-eligible buildings would be avoided to the extent possible. If an eligible structure were selected, any alterations undertaken would preserve the historic integrity of the building. Therefore, implementation of the Consolidated Storage Alternative would have no impact on cultural resources at the New Haven Depot, Somerville Depot, Warren Depot, or PEZ Lake Development. Minor impacts to NRHP-eligible structures could occur at the Hawthorne Army Depot or the Utah Industrial Depot if these structures were selected for storage. However, these impacts would not impair the historic integrity of the structures.

4.3.11 Land Use and Visual Resources

No impacts on land use and visual resources are anticipated at each consolidated storage location because no new construction or other ground-disturbing activities would be required. Table 4.3–16 presents the current and projected storage space requirements at each location under the Consolidated Storage Alternative. At all the locations being considered, receipt, staging, and storage activities would continue to generally take place inside existing warehouses and would not require the use of any additional site acreage. Therefore, onsite land use would remain predominantly light industrial and viewsheds would not be affected. Consolidated storage operations would only marginally increase the traffic flow to and from the consolidated storage location. Scheduled maintenance to the warehouses would be consistent with the existing land use and visual character of the site. Consolidated storage of mercury stockpiles would likewise not be expected to affect offsite land uses and viewsheds from public vantage points in the vicinity. Because there would be no change to the visual landscape as a result of this alternative, there would be no associated change in BLM VRM classifications.

Table 4.3–16. Storage Space Requirements at Each Location Under the Consolidated Storage Alternative

Consolidated Storage Location	Current Mercury Storage Configuration	Consolidated Mercury Storage Configuration
New Haven Depot	43,200 ft^2 in 1 warehouse section	200,000 ft^2 in 5 warehouse sections
Somerville Depot	80,000 ft^2 in 2 warehouse sections	200,000 ft^2 in 5 warehouse sections
Warren Depot[a]	40,000 ft^2 in 1 warehouse section	200,000 ft^2 in 5 warehouse sections
Hawthorne Army Depot[b]	No current mercury storage	200,000 ft^2 in 20 storage buildings or in 125 storage igloos
PEZ Lake Development	No current mercury storage	180,000 ft^2 in 2 warehouses
Utah Industrial Depot	No current mercury storage	180,000 ft^2 in 2 warehouses

a Consolidated storage at the Warren Depot would require renegotiation of the lease that expires in 2010.
b Consolidated storage at the Hawthorne Army Depot could occur using either storage buildings or storage igloos.

4.3.12 Infrastructure

Consolidated storage would have negligible to minor long-term impacts on the infrastructure of each consolidated storage location. There is no planned construction of new facilities, and all of the utilities needed to support this alternative are already available at each location. Tables 4.3–17 through 4.3–19 list the current usage, additional requirements, total usage, and site capacity for electricity, fuel, and water resources, respectively. Electrical consumption would increase 6 percent or less at each location to support the space needed for consolidated storage, and although projected water use would more than double for one site (Somerville Depot) it would not exceed the available site water capacity. No additional fuel resources would be required as well, although a minor, short-term increase in propane and/or gasoline usage is anticipated during inspection and reflasking activity during the last year of storage.

Table 4.3–17. Electrical Consumption Under the Consolidated Storage Alternative (MWh/yr)

Consolidated Storage Location	Existing Usage	Additional Requirement	Total Usage	Site Capacity
New Haven Depot	1,368	20	1,388	3,500
Somerville Depot	989	15	1,004	a
Warren Depot	416	20	436	a
Hawthorne Army Depot[b]	7,386	0	7,386	109,500[c]
PEZ Lake Development	450	26	476	37,800[c]
Utah Industrial Depot	34,000	26	34,026	66,000[d]

[a] Utility capacity is unknown.
[b] Consolidated storage at Hawthorne Army Depot could occur using either storage buildings or storage igloos. Because neither type of storage facility is serviced by electricity, a portable gasoline-powered generator would be used to supply the electricity needed for inspections.
[c] Assumes 1 kVA equals 1 KW (power factor of 1).
[d] Capacity of the Army's substation.
Source: Appendix C of this MM EIS; Army 1998; Bourn 2002; Chazen 2002; Downs 2002a, 2002b; DZHC 2002; Farley 2002a; Guida 2001; Gulino 2002; Lynch 2001a, 2001b, 2002a; Olszewski 2002; Pittano 2002a, 2002b; Smith 2002b.

Table 4.3–18. Fuel Consumption Under the Consolidated Storage Alternative

Consolidated Storage Location	Existing Usage	Additional Requirement	Total Usage	Site Capacity
New Haven Depot				
Oil (gal/yr)	8,000	0	8,000	8,900[a]
Gasoline (gal/yr)	2,500	0[b]	2,500	1900[a]
Somerville Depot				
Natural gas (ft^2/yr)	84,400	0	84,400	(c)
Oil (gal/yr)	600	0	600	1,000[a]
Gasoline (gal/yr)	6,000	0[b]	6,000	1,000[a]
Warren Depot				
Oil (gal/yr)	7,500	0	7,500	4,350[a]
Gasoline (gal/yr)	1,500	0[b]	1,500	970[a]
Hawthorne Army Depot				
Propane (gal/yr)	62,000	(b)	62,000	150,000[a]
Oil (gal/yr)	1,000,000	0	1,000,000	264,200[a]
Gasoline (gal/yr)	170,000	900[d]	170,900	1,000[a]
PEZ Lake Development				
Propane (gal/yr)	0	(b)	0	0
Oil (gal/yr)	9,000	0	9,000	6,285[a]

Consolidated Storage Location	Existing Usage	Additional Requirement	Total Usage	Site Capacity
Utah Industrial Depot				
Natural gas (ft^3/yr)	75,000,000	0	75,000,000	300,000,000
Propane (gal/yr)	0	(b)	0	60,000[a]
Gasoline (gal/yr)	0	0	0	0

[a] Includes capacity of refillable storage tank(s).
[b] Small increase in gasoline and/or propane use anticipated during the last year of storage.
[c] Utility capacity is unknown.
[d] Consolidated storage at the Hawthorne Army Depot could occur using either storage buildings or storage igloos. Additional onsite truck trips would be needed to move the mercury from the rail line to the storage igloos. These truck trips would consume approximately 307 gal (1,162 l) of gasoline. Portable gasoline powered generators would be used to supply electricity for inspections. These generators are estimated to use 900 gal (3,407 l) of gasoline each year.

Source: Appendix C of this MM EIS; Army 1998; Bourn 2002; Chazen 2002; Downs 2002a, 2002b, 2002c; DZHC 2002; Farley 2002a; Guida 2001; Gulino 2002; Lynch 2001a, 2001b, 2002a; Olszewski 2002; Pittano 2002a, 2002b; Smith 2002b.

Table 4.3–19. Water Consumption Under the Consolidated Storage Alternative (gal/yr)

Consolidated Storage Location	Existing Usage	Requirement for Consolidated Storage	Total Usage	Site Capacity
New Haven Depot	36,500	10,800	47,300	42,000,000[a]
Somerville Depot	10,400	10,800	21,200	788,400,000
Warren Depot	44,800	10,800	55,600	262,800,000
Hawthorne Army Depot[b]	82,125,000	10,800	82,135,800	567,648,000
PEZ Lake Development	91,250,000	10,800	91,260,800	328,500,000
Utah Industrial Depot	268,272,080	10,800	268,282,880	525,600,000

[a] Assumes 80 gal/min total flow from onsite wells.
[b] Consolidated storage at the Hawthorne Army Depot could occur using either storage buildings or storage igloos. Storage of mercury in igloos is not expected to require additional water over that required for storage in buildings.

Source: Appendix C of this MM EIS; Army 1998; Bourn 2002; Chazen 2002; Downs 2002a, 2002b; DZHC 2002; Farley 2002b; Guida 2001; Gulino 2002; Lynch 2001a, 2001b, 2002a; Olszewski 2002; Pittano 2002a, 2002b; Smith 2002b.

No additional roads or railroads would be required under the Consolidated Storage Alternative. As discussed in Section 4.3.1, the number of truck or rail shipments that would be required to transport all of the elemental mercury to each consolidated storage location would be completed over the course of a few months and are expected to result in negligible to minor, short-term increases in traffic along the roads and rails leading into the consolidated storage location.

4.3.13 Environmental Justice

As described in Chapter 3, minority and low-income populations are not concentrated near the New Haven, Somerville, or Warren depots. Therefore, no disproportionately high and adverse effects are expected on minority and low-income populations as a result of consolidated storage at these locations.

However, there are concentrations of minority and/or low-income individuals near the Hawthorne Army Depot, PEZ Lake Development, and Utah Industrial Depot. Because the changes in employment would be very small (see Section 4.3.3), there would be no disproportionately high and adverse effects on minority and low-income populations. As discussed in Section 4.3.4, the Consolidated Storage Alternative would result in negligible offsite human health and ecological risks from mercury emissions during normal operations. Therefore, no disproportionately high and adverse effects on minority and low-income populations would occur from normal operations.

As discussed in Section 4.3.5, the offsite human health risks due to accidental releases of mercury would be negligible. Therefore, no disproportionately high and adverse effects on minority and low-income populations would occur from facility accidents. In contrast, the ecological risks to plants and animals due to accidental releases of mercury could be moderate. These contaminated plants and animals may pose a risk to some individuals who depend on subsistence fishing and hunting. These persons would only be exposed if the prevailing winds contaminated fish and wildlife in an area where they commonly hunted, fished, or otherwise collected plants and animals. These collection areas may differ from the residence locations of the potentially affected individuals.

4.4 ALTERNATIVE 3A: SALE OF MERCURY AT THE MAXIMUM ALLOWABLE MARKET RATE

Alternative 3A would entail the resumption of sales from the DNSC mercury stockpile at a rate of 5,000 flasks per year. See Section 2.2.3.1 for a more detailed description of this alternative. DNSC estimates that sales at this rate would have no substantial impact on the world mercury market (Lynch 2002b). At this rate, it would take 26 years to sell the entire DNSC mercury stockpile.

In addition, selling the mercury would have the overall long-term beneficial impact of eliminating the impacts of storing the mercury at the New Haven, Somerville, and Warren depots and Y–12. Resources would no longer be needed to maintain the mercury stockpile at these locations, and the warehouse space would be free to be used for other beneficial uses or could be decontaminated and decommissioned.

4.4.1 Meteorology, Air Quality, and Noise

Meteorological events such as heavy snow, tornadoes, high winds, and lightning can result in damage to buildings such as the mercury storage warehouses. The frequency and consequence of such events were considered in selecting the accident events described in Section 4.4.5.

Continuing to store mercury until it is sold and shipping it to a buyer would have negligible impacts on the air quality and noise of the existing storage locations.

Existing facilities at the four storage locations would continue to be used for storage of mercury until it is shipped to a buyer; there are no modifications to the natural environment planned, such as clearing of trees or removing natural vegetative cover.

Minor air quality impacts would result from transporting mercury to the buyer. Air quality impacts would result from an increase in truck or rail activity at the New Haven, Somerville, and Warren depots and Y–12. The number of truck or rail trips would be similar to those for other alternatives where the mercury would be removed from the current storage sites. These truck trips or rail trips would be expected to occur over a period of 26 years (see Appendix C). A total of approximately 308 truck shipments or 154 railcars would be required to ship the mercury from the various storage locations. These impacts would be similar to those for other alternatives; that is the resulting small increase in air pollutant emissions along roads or rails used to access the depot would be expected to be minor compared to existing traffic emissions. Transport of the mercury would not be expected to result in air pollutant concentrations exceeding the applicable ambient air quality standards.

Shipping from a commercial port would result in small increases in air pollutant emissions at the port facilities from handling the shipping containers, with negligible to minor air quality impacts expected. If shipped by regularly scheduled commercial ship, no increase in air pollutants would be directly attributable to shipping on the global commons.[6] Air permitting requirements and NESHAP are not applicable to shipping mercury or continued storage.

Some noise impacts would result from transporting mercury to the buyer. Noise impacts at the New Haven, Somerville, and Warren depots and Y–12 would result from an increase in truck or rail activity at these sites. The number of truck or rail trips would be similar to those for other alternatives where the mercury would be removed from the current storage sites. These truck trips or rail trips would be expected to occur over a period of up to 26 years, depending on the storage location (see Appendix C). The resulting increase in day-night average noise levels along roads used to access the depots would be expected to be less than 1 dBA. The change in truck or rail traffic would not be expected to result in a change in noise levels along the shipping routes that would be noticeable to the public or result in an increase in annoyance.

There would be no modifications to the facilities at the current storage sites that would result in changes in noise levels at nearby noise sensitive areas. Regular maintenance to the warehouses would continue and are not expected to result in any offsite noise impacts. There are no loud impulsive noises expected that would disturb wildlife.

Although a small amount of activity at a port related to handling the shipping containers could be attributed to mercury shipments, no change in noise levels at the port would be expected.

4.4.2 Waste Management

Under Alternative 3A, potential waste generated by activities associated with the storage of mercury until it is sold would be a portion of the waste generation rates presented for each site under the No Action Alternative. It is estimated that during the 26 years it would take to sell off the entire inventory from all four storage locations, waste generation should not appreciably change from current rates. Therefore, it is anticipated that the storage of mercury until it is sold would have negligible or no impact on waste management activities at the site.

4.4.3 Socioeconomics

Under Alternative 3A, existing personnel at the New Haven, Somerville, and Warren depots and Y–12 would prepare mercury flasks for sale. As described in Chapter 2, the pallets would be moved by forklift to a staging area where the drums would be inspected, labeled, belly banded, and loaded onto commercial transport vehicles. Because employment levels would remain constant during sales operations, negligible impacts on socioeconomic conditions near the depot are anticipated. After the 13- to 26-year period over which the mercury inventory would be sold from each storage location, a reduction of 0.046 to 1.12 FTEs would occur.

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[6] Global commons is any territory (land, water, and air space) that is outside the territorial jurisdiction of any nation, and includes Antarctica and the oceans outside the territorial limits of any nation.

4.4.4 Human Health and Ecological Risk from Normal Operations

It would take about 26 years to sell the mercury stockpile at the maximum allowable market rate of 5,000 flasks per year. During this time, the stockpile would continue to be safely stored and maintained as under the No Action Alternative. Therefore, the human health and ecological risks from normal operations would be the same as those for the No Action Alternative at each storage location for as long as the mercury remained on site.

4.4.5 Human Health and Ecological Risk from Facility Accidents

It would take about 26 years to sell the mercury stockpile at the maximum allowable market rate of 5,000 flasks per year. During this time, the stockpile would continue to be safely stored and maintained as under the No Action Alternative. The potential accident scenarios and consequence levels for this Sales Alternative would be the same as those for the No Action Alternative discussed in Section 4.2.1.5—single flask spill, single pallet spill, earthquake spill, and forklift fuel fire. However, because risk is expressed as a function of the frequency of occurrence of an accident and the magnitude of the consequences, the Sales Alternative has a greater potential for accidental releases of mercury from the stockpile (from accidents other than earthquakes) than the No Action Alternative because it requires a higher level of handling and shipping activity. For this Sales Alternative, the frequency for the single pallet spill scenario is high because of the additional activity required to load pallets onto either a truck or a railcar at the originating location and to unload pallets at the destination. The frequency of the forklift fuel fire also increases to the low category. For the earthquake, the frequency of occurrence is moderate, and the failure rate would remain the same (estimated to be 5 percent) (DLA 2003:2-3, 2-7).

The methodology derived from EPA risk assessment guidance specifies that if either the frequency or the severity of the consequence is negligible, the risk is determined to be correspondingly negligible (DLA 2003:1-4). Therefore, only the risk associated with the forklift fuel fire for the involved worker increases from that indicated in Table 4.2–1, from negligible to moderate (DLA 2003:4-7). Risks to ecological receptors are the same as those for the Consolidated Storage Alternative discussed in Section 4.3.5.

4.4.6 Transportation

The impacts of transportation under Alternative 3A for sales to domestic buyers would be similar to those of the Consolidated Storage Alternative (DLA 2003:2-12). For sales to foreign buyers, transportation is analyzed in three segments: domestic ground transportation from the storage sites to the port by truck and rail, ocean-going vessel transport, and ground transport of the mercury from the foreign port of destination to the mercury user. Table 4.4–1 provides the summed accident frequencies for these three transportation segments. For bounding purposes only, ocean-going transport is evaluated from New York City, New York to Amsterdam, Netherlands; to Bombay, India through either the Suez or Panama Canals; and from San Francisco, California to Bombay, India. This analysis very conservatively assumes that 40-ft (12-m) ISO-freight containers would be transported one at a time both from the storage location to the port via truck and aboard ship, thereby requiring 308 truck and ocean-going vessel segments. This maximizes the mileage traveled and the associated risk of transport. (For rail transport, the assumption is two 40-ft (12-m) ISO-freight containers per shipment.) It is also likely that the actual probability of a catastrophic accident is overstated because this analysis considers a high number of marine miles traveled by placing one shipping container at a time on a ship. It is more likely that multiple containers would be placed on a single ship rather than shipping only one container per shipload. Furthermore, it is important to note that the estimated vessel accident frequencies refer to all types of accidents rather than those specifically likely to result in cargo loss; the probability of actual cargo loss is only a fraction of the estimated frequencies. The predicted frequency of accidents via ship is much smaller than for truck or rail transportation to the ports, with the exception of the very short rail trip from Somerville to New York.

Table 4.4–1. Summed Accident Frequencies for Delivery of Mercury from the Storage Facility to Foreign End Users (yr)

Vessel Origin Port, Destination and Route	Accident Frequency			Total Estimated Accident Frequency for Foreign Sales
	Domestic Truck Transport	Ocean Shipping	Foreign Truck Transport[a]	
New York to Amsterdam	7.3×10^{-6} to 1.1×10^{-4}	$\sim1.0\times10^{-6}$	1.6×10^{-4}	1.7×10^{-4} to 2.7×10^{-4}
New York to Bombay via Suez Canal	7.3×10^{-6} to 1.1×10^{-4}	$\sim2.0\times10^{-6}$	1.6×10^{-4}	1.7×10^{-4} to 2.7×10^{-4}
New York to Bombay via Panama Canal	3.7×10^{-4} to 4.6×10^{-4}	$\sim2.0\times10^{-6}$	1.6×10^{-4}	5.3×10^{-4} to 6.2×10^{-4}
San Francisco to Bombay	3.7×10^{-4} to 4.6×10^{-4}	$\sim2.0\times10^{-6}$	1.6×10^{-4}	5.3×10^{-4} to 6.2×10^{-4}

[a] Assumes 500 truck miles traveled from destination port, and that the rate for foreign truck accidents is twice the rate of domestic truck accidents.

Note: Approximately twice the number of trucks trips would be needed than rail trips for domestic transportation. Truck transportation is assumed to maximize potential impacts.

Source: DLA 2003:Table 2-15.

The likelihood of spills of mercury occurring at a port is believed to be minimal. Container handling accidents for ocean-going vessels in port are most likely to occur at the time a container is being loaded or unloaded from a ship, and thus is a critical point in the handling cycle for the cargo. Loading or unloading trucks to and from shipping containers is likely to be very similar in nature to activities occurring at stockpile facilities during consolidation. Once in the shipping container, the consequence of an accident in port (as well as at sea) is likely to be negligible given that a release of mercury would require breaching the shipping container, the overpack drum, and the steel flask which contains the mercury. Furthermore, an accident occurring in port would be subject to immediate emergency response to contain any release. Finally, the frequency of accidents related to overland transport (i.e., getting to and from the port) overwhelms the frequency of accidents for ocean-going vessels. Spilled mercury in the port harbor has the highest likelihood of localized, practical recovery and mitigation efforts. Mercury is only sparingly soluble in water and would tend to associate with the harbor sediments. Cleanup efforts could be directed to the immediate area.

Any releases of mercury that would occur would affect three distinct marine environments; the harbors of departing or destination ports; the continental shelf, which is the shallow ocean reaching the departing or destination harbors; or the deeper portions of the ocean from the continental margin (which includes the continental shelf, slope and rise). The continental margins comprise about 21 percent of the total ocean to the Abyssal Plain (the deep and relatively flat portion of the ocean floor).

Mercury that is lost to the environment as a result of a spill has the greatest potential to impact areas with the highest density of marine organisms. The density of marine organisms is linked to available opportunities for viable habitat. Although there is abundant diversity in the species inhabiting the deeper portions of the ocean, the opportunities for habitat are greatest in the shallower portions of the ocean. The density of marine organisms is thus greatest in the shallower portions. It is important to note that although the continental margins occupy a significant portion of the ocean (Grove 2002), the continental shelf with the most abundant habitat represents a smaller portion of this area.

Loss of the mercury cargo occurring over the continental shelf would present difficult mitigation strategies, although recovery of cargo may be possible depending on the disposition of the spill (i.e., the cargo remains intact and is identifiable) and the depth of water encountered. Loss of mercury cargo occurring in the deep ocean would present great challenges for mitigation of spills or recovery of the cargo. Such efforts would likely be entirely impractical and it is unlikely that the lost cargo would be subject to effective mitigation or recovery efforts.

For several reasons, precise estimates of the environmental consequences are not possible. Although releases of mercury cargo during shipment via ocean-going vessels are possible (as indicated by the estimated frequencies), the environmental impacts of such a loss of the cargo are highly dependent on the conditions encountered at the time of the loss. For example, topographic variability along the shore produces significant influences on the near shore circulation that could dramatically affect mixing of any mercury released within the shallow waters (Allen 2002). As is the case for release into harbor waters, any mercury released would tend to associate with the marine sediment due to the low solubility of mercury in water. Over time and under the influence of environmental processes (i.e., oxidation/reduction, complexes with inorganic and organic material), mercury remaining in direct contact with seawater would dissolve at a low rate based on the solubility and form of the mercury. The mercury would then be entrained in the prevailing ocean currents and enter the global mercury cycle (DLA 2003:2-18, 2-19).

The railcar or truck fire scenario postulates the release of mercury into the atmosphere over a fire duration of 12 minutes for the truck fire and 22 minutes for the railcar fire with subsequent transport downwind. As for onsite fires, concentrations are projected for a range of distances from the source of contamination and are therefore applicable to any accident location. Elemental mercury released as a result of the accident would be expected to remain airborne rather than deposit locally. Divalent mercury formed as a result of the fire would be expected to deposit locally either as a result of dry deposition or rainfall scavenging (i.e., wet deposition). Once deposited, the mercury would be expected to mix completely with the top 2 in (5 cm) of soil (DLA 2003:4-9).

Table 4.4–2 shows that the maximum predicted exposure point concentration is 2.27 mg/m^3 for the offsite truck fire and 2.41 mg/m^3 for the offsite railcar fire. The potential risk to workers from either a truck or railcar crash with fire is low. Because the benchmark is more stringent (i.e., more protective) for the public, even though the EPCs are the same, the potential risk is moderate.

Table 4.4–2. Exposure Point Concentrations in Air for Offsite Truck and Railcar Fires (Acute Health Effects)

Event	Receptor	Receptor Location (ft)	EPC (mg/m^3)	Benchmark (mg/m^3)	Ratio[a]	Consequence Level[b]	Frequency[c]	Risk Level[d]
Truck Fire	Offsite worker	7,090	2.27	10	0.2	Low	Moderate	Low
	Public	7,090	2.27	1.67	1.4	Moderate	Moderate	Moderate
Railcar Fire	Offsite worker	7,520		10	0.2	Low	Low	Low
	Public	7,520	2.41	1.67	1.4	Moderate	Low	Moderate

[a] Ratio of EPC/Benchmark level.

[b] Consequence levels correspond to the following ratios of EPC/Benchmark: >10, high; >1 and ≤10, moderate; >0.1 and ≤1, low; ≤0.1, negligible.

[c] Frequency categories are defined in Table 4.1–2.

[d] Risk levels are defined in Table 4.1–3.

Source: DLA 2003:Tables 2-16, 4-9, 4-13.

For airborne exposures occurring from a spill with no fire during a transportation accident, it is assumed that about 25 percent of the mercury is released. The release is equivalent to 105 flasks of mercury per truckload (7,980 lb [3,620 kg]) or 210 flasks per railcar (16,000 lb [7,258 kg]). As shown in Table 4.4–3, the consequences in the immediate area of the spill fall well below the immediately dangerous to life or health level, and consequences for receptors 328 ft (100 m) downwind fall well below their respective benchmarks. Therefore, the acute human health risk from spills occurring during transportation is negligible. Because mercury vapor evaporating from a spill remains in the elemental form and does not deposit on the ground, there is no local chronic exposure pathway (DLA 2003:4-13).

Table 4.4–3. Exposure Point Concentrations in Air for Offsite Truck and Rail Spills Without Fire (Acute Health Effects)

Release Scenario	EPC in Immediate Area (mg/m^3)	IDLH Ratio	EPC at 100 m Downwind (mg/m^3)	ERPG-2 Ratio	Consequence Level[a]	Frequency[b]	Risk Level[c]
Truck spill	1.55	0.16	0.0649	0.06	Negligible	Moderate	Negligible
Rail spill	2.19	0.22	0.0914	0.09	Negligible	Moderate	Negligible

[a] Consequence levels correspond to the following ratios of EPC/Benchmark: >10, high; >1 and ≤10, moderate; >0.1 and ≤1, low; ≤0.1, negligible.

[b] Frequency categories are defined in Table 4.1–2.

[c] Risk level, as defined in Table 4.1–3, is a function of consequence level range and frequency range.

Key: EPC, exposure point concentration; ERPG, emergency response planning guideline; IDLH, immediately dangerous to life or health.

Note: Release height: ground level, wind speed 4.5 m/s at 10 meters, stability Class D.

Source: DLA 2003:Table 4-14.

Exposure concentrations, benchmark ratios, and consequence levels for ecological receptors exposed to divalent mercury after a truck crash and subsequent fire during transport under the Sales Alternatives are the same as presented in Section 4.3.6 for the Consolidated Storage Alternative. However, because the frequency of a truck fire is predicted to be moderate for the Sales Alternatives rather than low as for the Consolidated Storage Alternative, the risk levels for certain receptors increase, as identified in Table 4.4–4.

Table 4.4–4. Risk Levels for Exposure of Ecological Receptors to Mercury After a Truck Fire[a]

		Dry Deposition[b]		Wet Deposition[c]	
Receptor	Medium	Inorganic Mercury	Methyl Mercury	Inorganic Mercury	Methyl Mercury
Plants	Dry soil	Low	NA	High	NA
Soil invertebrates	Dry soil	Low	Negligible	High	Negligible
Short-tailed shrew	Dry soil	Negligible	Negligible	Negligible	Moderate
American robin	Dry soil	Negligible	Low	High	High
Red-tailed hawk	Dry soil	Negligible	Negligible	Negligible	Negligible
Plants	Wetland soil	Low	NA	High	NA
Soil invertebrates	Wetland soil	Low	Negligible	High	Low
Short-tailed shrew	Wetland soil	Negligible	Low	Negligible	High
American robin	Wetland soil	Negligible	Moderate	High	High
Red-tailed hawk	Wetland soil	Negligible	Negligible	Negligible	Low
Benthic invertebrates	Sediment	Moderate	NA	High	NA

Receptor	Medium	Dry Deposition[b] Inorganic Mercury	Dry Deposition[b] Methyl Mercury	Wet Deposition[c] Inorganic Mercury	Wet Deposition[c] Methyl Mercury
Great blue heron	Sediment	Negligible	Negligible	Negligible	Low
Aquatic biota	Surface water	Negligible	Low	Negligible	High
Great blue heron	Surface water	Negligible	Negligible	Negligible	High

[a] Risk levels are defined in Table 4.1–3.
[b] Dry deposition and concentrations of divalent mercury at 2000 m downwind (maximum concentration deposited).
[c] Wet deposition and concentrations of divalent mercury at 100 m downwind (maximum concentration deposited).
Key: NA, not applicable.
Source: DLA 2003:Table 5-8.

Note that except for exposure of the American robin to wetland soils and for benthic invertebrates, moderate or higher risk levels occur only for wet deposition (that is, if it is raining during the fire). Because the simultaneous occurrence of a fire and rainfall for the duration of the fire is much less likely than either event alone, the frequency of wet deposition after a fire is lower than assumed in the analysis. If it is assumed that wet deposition can occur only 10 percent of the time, the frequency of wet deposition after a truck or railcar crash with fire would be negligible for deposition to dry soil. The frequency of deposition to a wetland or pond is even less than the frequency of deposition to dry soil because the wetland or pond would have to lie downwind from the fire, and it is not certain that the wind would be blowing from the accident site directly over a wetland or pond. Therefore, although exposures would be high in the event of deposition to a wetland or pond, the low probability of the event makes it unlikely that harm would result from truck or rail transportation under the Sales Alternatives. Therefore, the conclusion that high ecological risk levels would result from wet deposition after a fire is an extremely conservative conclusion (DLA 2003:5-15, 5-16).

In addition, risks were evaluated at the maximum modeled soil concentration. However, the soil concentration after wet deposition would be expected to decrease with distance downwind from the maximum location; thereby, likely overstating the predicted risk. Moderate risk levels for the American robin in a wetland and for benthic invertebrates in a pond after dry disposition are predicted to result in distances downwind of about 3,937 ft (1,200 m) to about 13,124 ft (4,000 m) from a truck accident. For wet deposition to dry soil, a high risk level for soil invertebrates is predicted to exist for more than 16,405 ft (5,000 m) downwind. For other receptors, the distances would be lower (for example, about 8,202 ft [2,500 m] for plants and 4,922 ft [1,500 m] for songbirds). In the case of wet deposition to ponds and wetlands, however, high risk levels would occur for several thousand meters downwind from the truck fire (DLA 2003:5-16).

For railcar accidents, if a fire and rain occurred at the same time, moderate risk levels for soil invertebrates in dry soil and wetland soil would occur for nearly 32,810 ft (10,000 m) downwind. Moderate risk levels for songbirds like the American robin would be limited to the first 4,922 ft (1,500 m) downwind for deposition to dry soil. For benthic invertebrates, moderate risk levels would also result if the pond where mercury is deposited is less than 32,810 ft (10,000 m) downwind (DLA 2003:5-19).

The low-to-negligible probability that a fire would occur while it is raining and the limited area involved, together with the negligible risk from spills without a fire, suggest that the ecological impact of transportation accidents for the Sales Alternatives is not likely to be of concern. In addition, the potential for a truck or railcar spill directly into a waterbody was determined to be negligible (DLA 2003:2-14, 2-15, 5-16, 5-20).

Because the frequency of a railcar crash and subsequent fire is low, exposure concentrations, benchmark ratios, and consequence and risk levels for ecological receptors exposed to divalent mercury resulting from a railcar crash and subsequent fire are the same for the Sales Alternative as for Consolidated Storage Alternative presented in Tables 4.3–14 and 4.3–15, found in Section 4.3.6 of this MM EIS.

4.4.7 Geology and Soils

No impacts on geology and soils are anticipated at the existing storage locations under this alternative because no new construction or other ground-disturbing activity would be required during the timeframe required to sell off and draw down the mercury stockpile at each location. As discussed for the No Action Alternative (see Sections 4.2.1.7, 4.2.2.7, 4.2.3.7, and 4.2.4.7), the potential for site geologic conditions, including geologic hazards, to affect existing operations at the New Haven, Somerville, and Warren depots and at Y–12 is generally low. However, Y–12 is located in east-central Tennessee that has a relatively moderate seismicity and is susceptible to earthquake ground motion that could cause considerable damage to ordinary structures but would not be expected to substantially affect properly designed and constructed facilities. Historical and predicted earthquake-produced ground motion at the existing storage locations would be unlikely to cause the kind of structural damage to storage buildings and their contents necessary to release mercury from their overpacks. As a result, interim storage at the existing storage locations would not be expected to impact geologic or soil resources, nor be jeopardized by geologic conditions.

4.4.8 Water Resources

Although the annual, average demand at each existing storage location under this alternative would not change as compared to the No Action Alternative, total incremental water use associated with mercury storage operations under this alternative would vary greatly among the current mercury storage locations. Specifically, water use would be approximately 17,600 gal (66,623 l) at the New Haven Depot over 13 years; 165,150 gal (625,159 l) over 26 years at the Somerville Depot; 19,140 gal (72,453 l) over 14 years at the Warren Depot; and about 3,915 gal (14,820 l) over 15 years at Y–12. These total water use values would also approximate sanitary wastewater generation at the respective storage locations. Nevertheless, it is expected that the existing water supply and wastewater treatment infrastructure at each location would be able to accommodate these and other site demands over the specified timeframes.

The potential for impacts on water resources at each of the current storage locations would be limited to any spills and/or other unforeseen releases that might occur during the specified timeframes required to sell and draw down the mercury inventory at each site. The potential for spills to occur is described in the *Draft Risk Assessment Report* (DLA 2003). Best management practices and DNSC procedures for material storage and handling would continue to be observed at each location to include periodic visual inspections of mercury storage locations and mercury vapor monitoring, as further discussed under the No Action Alternative (see Sections 4.2.1.8, 4.2.2.8, 4.2.3.8, and 4.2.4.8).

As sales proceed, mercury would be prepared for shipment in accordance with the same procedures and safeguards and using the same work practices as discussed under Section 4.3.8 above, with the following exception. Once mercury storage pallets have been moved to the staging area by forklift and inspected and secured, the secured pallets would then be loaded into 40-ft (12-m) ISO-freight containers, rather than directly being placed onto a truck or railcar, for transport to a U.S. port for eventual shipment abroad. The configuration of these containers is further described in the *Draft Risk Assessment Report* (DLA 2003). The construction, size, and configuration of the containers selected would help ensure that the mercury pallets and their contents remain secure and intact during long-distance transport. Once at the port, cranes would transfer the 40-ft (12-m) ISO-freight containers from each truck or railcar to a commercial ship. Overall, negligible or no impact on water resources would be expected as a result of routine mercury handling and shipment preparation and transport under this alternative. An analysis of potential environmental consequences resulting from transportation accidents, including shipment overseas, is presented in Section 4.4.6.

4.4.9 Ecological Resources

This alternative would not involve any new construction or modifications to the existing buildings required for safe mercury storage and would not likely result in any appreciable changes to current conditions. As described in Section 2.2.4, routine inspections and air monitoring would detect any leaks. Although it is possible that flasks may leak in the 26 years it would take to sell the entire inventory of mercury at the maximum allowable market rate, it would not escape the warehouses because the floors are sealed, there are no floor drains, the drums are stored in drip pans, and the flasks are stored in air-tight drums. With the proximity of the staging area to the proposed truck and rail loading areas, the movement of pallets using a forklift would result in little or no impacts on ecological resources. Likewise, the increase in traffic from the commercial vehicles required to move the mercury from the sites is marginal. Therefore, negligible or no impacts on ecological resources, including terrestrial and aquatic resources, wetlands, and threatened and endangered species, are anticipated.

4.4.10 Cultural Resources

Under Alternative 3A, new facilities and modifications to existing facilities are not required to prepare mercury for sale. Because onsite property would not be disturbed, no impacts on cultural resources are expected.

4.4.11 Land Use and Visual Resources

No impacts on land use and visual resources would be expected at the storage locations from which mercury would be shipped (the New Haven, Somerville, and Warren depots and Y–12) as a result of selling the mercury at the maximum allowable market rate. This rate would equate to selling 5,000 mercury flasks per year, and would require 26 years to sell the entire DNSC mercury stockpile. Over this period, staging and loading activities would generally take place inside existing warehouses, and increased traffic flow associated with transporting mercury from each of the current mercury storage sites would be marginal. Once removal of the mercury from each site is completed, the current storage facilities would be available for potential closure, disposal, or reuse.

4.4.12 Infrastructure

Continuing to store mercury until it is sold would have a negligible impact on site infrastructure because no new construction or change in operations is anticipated. Initially, infrastructure use for this alternative would be equivalent to that described for the No Action Alternative, but would be reduced over time as mercury is shipped from the storage locations. The current electricity, fuel, water, and site safety services, as described in Sections 3.2.10, 3.3.10, 3.4.10, and 3.5.10, are capable of supporting all anticipated activities associated with this alternative.

Minor increases in the amount of fuel needed to operate forklifts used for loading pallets onto buyers' trucks/railcars for transportation would be expected. However, this increase would be spread over 13 to 26 years depending on the storage location and the increase in any given year would be very small.

Due to reductions in required storage space and depot personnel, the amount of electricity and potable water needed to support this alternative would slowly decrease over time at each of the depots as the amount of mercury maintained in storage decreases.

Transport of the mercury would be expected to result in negligible, short-term increases in traffic along the roads and rails leading to and from the four storage locations. Transportation associated with the alternative to sell mercury at the maximum allowable market rate would require a total of 308 shipments over a period of 26 years (see Appendix C). This amounts to approximately 3 to 7 shipments per year from each storage location. If the mercury were moved by rail, approximately 156 shipments would be required (see Appendix C).

4.4.13 Environmental Justice

As described in Chapter 3, minority and low-income populations are not concentrated near the New Haven, Somerville, and Warren depots. Therefore, no disproportionately high and adverse effects are expected on minority and low-income populations near these sites.

At Y–12, the environmental justice impacts of this alternative would be bounded by the No Action Alternative. As described in Appendix C (see Table C–3) under the alternative for sale of mercury at the maximum allowable market rate, mercury would be shipped out over a period of approximately 15 years. The potential risks to minority and low-income populations near Y–12 would cease once the mercury was removed. Because the changes in employment would be very small (see Section 4.4.3), there would be no disproportionately high and adverse effects on minority and low-income populations.

4.5 ALTERNATIVE 3B: SALES TO REDUCE MERCURY MINING

Mercury is supplied to the world market through (1) mining and other mineral extraction of primary (virgin) mercury, (2) recovery through refining of natural gas, (3) recovery through the recycling of spent products and waste from industrial processes, (4) sale from government stocks, and (5) sale from private industrial stocks. Although precise data are unavailable, estimates of global consumption of mercury suggest that demand for the material is declining. In 1993, world consumption of mercury was estimated to be 4,226 tons (3,834 metric tons), compared with current global consumption estimates of 2,205 tons (2,000 metric tons) (EPA 2002b; UNEP 2002:95).

Alternative 3B would include selling the entire DNSC mercury stockpile to a mercury mining company with the contractual requirement that mercury mining would be reduced accordingly, and that the purchased DNSC mercury would be sold at a rate no greater than the mining company would have sold newly mined mercury. See Section 2.2.3.2 for a more detailed description of this alternative.

4.5.1 Impacts on Existing Storage Locations

If all DNSC storage locations were to ship mercury as soon as possible, it would take less than 1 year to transport the entire DNSC mercury stockpile to the buyer's location. Selling the mercury would have the overall long-term beneficial impact of eliminating the impacts of storing the mercury at the New Haven, Somerville, and Warren depots and Y–12. Resources would no longer be needed to maintain the mercury stockpile at these locations, and the warehouse space would be available for other beneficial uses or could be decontaminated and decommissioned. The potential impacts of the packaging and transport of the mercury from the existing storage locations is described below.

4.5.1.1 Meteorology, Air Quality, and Noise

Meteorological events such as heavy snow, tornadoes, high winds, and lightning can result in damage to buildings such as the mercury storage warehouses. The frequency and consequence of such events were considered in selecting the accident events described in Section 4.4.5 for Alternative 3A. These events are also applicable to Alternative 3B.

Continuing to store mercury until shipping it to a buyer will have only minor impacts on the air quality and noise of the existing storage locations. Air quality impacts would result from an increase in truck or rail activity while mercury is moved. Approximately 308 truck shipments or 154 railcars would be required to ship the mercury from the various storage locations. The resulting short-term increase in air pollutant emissions along the truck routes or rail routes would be expected to be minor compared to existing traffic emissions and would occur over a period of a few months. Transport of mercury would not be expected to result in air pollutant concentrations exceeding the applicable ambient air quality standards.

Short-term noise impacts are expected to be similar to those of Alternative 3A (Section 4.4.1), except that the duration of shipping activities would occur over a period of months rather than over many years. The change in truck or rail traffic would not be expected to result in a change in noise levels along the shipping routes that would be noticeable to the public or result in an increase in annoyance.

4.5.1.2 Waste Management

Under Alternative 3B potential waste generated by activities associated with the storage of mercury until it is sold is a portion of the waste generation rates presented for each site under the No Action Alternative. It is estimated that during the 27 to 127 days it would take to ship the mercury inventory from all four storage locations, waste generation would not appreciably change from current rates. Therefore, it is anticipated that the storage of mercury until it is sold would have negligible or no impact on waste management activities at the site.

4.5.1.3 Socioeconomics

Under Alternative 3B, existing personnel at the New Haven, Somerville, and Warren depots and Y–12 would prepare 600 mercury flasks for shipment each day. Mercury pallets would be moved by forklift to a staging area, where mercury would be inspected, labeled, belly banded, and loaded onto commercial transport vehicles. Because employment levels would remain constant during sales operations, negligible impacts on socioeconomic conditions near the site are anticipated. After the 27 to 127 workdays over which the entire mercury inventory would be shipped, site personnel would no longer be needed for mercury storage operations. This would result in a reduction of 0.046 to 1.12 FTEs, depending on the site, and similarly would have negligible impact on socioeconomic conditions near the site.

4.5.1.4 Human Health and Ecological Risk from Normal Operations

Under Alternative 3B, the entire inventory of excess mercury would be sold to a mercury mining company. It is assumed that the mining company would accept the entire surplus mercury inventory as soon as it could be delivered. However, until such time as the sale were completed, the stockpile would continue to be safely stored and maintained as under the No Action Alternative. Therefore, the human health and ecological risks from normal operations would be the same as those for the No Action Alternative at each storage location for as long as the mercury remained on site.

4.5.1.5 Human Health and Ecological Risk from Facility Accidents

Under Alternative 3B, the entire inventory of excess mercury would be sold to a mercury mining company. It is assumed that the mining company would accept the entire surplus mercury inventory as soon as it could be delivered. However, until such time as the sale were completed, the stockpile would continue to be safely stored and maintained as under the No Action Alternative. The potential accident scenarios and consequence levels for this Sales Alternative would be the same as those for Alternative 3A discussed in Section 4.4.5.

4.5.1.6 Transportation

Under Alternative 3B, all of the mercury would be loaded aboard a single ship, minimizing the number of shipments but maximizing the potential release volume. However, as discussed in Section 4.4.6, because the consequence of an accident in port or at sea is likely to be negligible, after the mercury is loaded into its shipping container, subsequent shipboard accidents are not considered. Overland transport of the mercury stockpile both domestically and between the destination port and the buyer would be bound by the analyses discussed in Section 4.4.6 for Alternative 3A.

4.5.1.7 Geology and Soils

Interim storage at the existing facilities during the timeframe required to ship the mercury from each location would not be expected to impact geologic or soil resources, nor be jeopardized by geologic conditions. Overall, implementation of this alternative would have minor, long-term beneficial impact on geology and soils as sale of the mercury stockpile to a mercury mining and refining entity would be likely to reduce the extraction of ores bearing mercury and other accessory metallic minerals.

4.5.1.8 Water Resources

Water use by DNSC personnel at each of the current storage locations under this alternative would be bounded by that presented in the No Action Alternative (see Sections 4.2.1.12, 4.2.2.12, 4.2.3.12, and 4.2.4.12). Potential impacts on water resources would be limited to the potential for spills and other unforeseen releases that might occur during the relatively short timeframes during which the mercury is readied for transport and shipped out as generally described in Section 4.3.8, with all transfer, staging, loading, and offloading activities conducted in accordance with the same procedures and safeguards and utilizing the same work practices. In the interim, as the mercury stockpile is readied and shipped from each storage location, best management practices and DNSC procedures for mercury storage and handling would continue to be observed to include periodic visual inspections and mercury vapor monitoring, as further discussed under the No Action Alternative (see Sections 4.2.1.8, 4.2.2.8, 4.2.3.8, and 4.2.4.8). Overall, negligible or no measurable impact on water resources would be expected as a result of routine mercury handling and shipment preparation and transport under this alternative. An analysis of potential environmental consequences resulting from transportation accidents, including shipment overseas, is described in Section 4.4.6 for Alternative 3A. These analyses are also applicable to Alternative 3B.

4.5.1.9 Ecological Resources

This alternative would not involve any new construction or modifications to the existing buildings. As described in Section 4.2.1.9, the flasks of mercury and their storage environment are designed and monitored such that storage before shipment and the movement of the flasks via forklift would result in little or no impacts on ecological resources. Likewise, the 20 to 91 days of increased traffic from commercial vehicles (approximately 2 truck trips or 1 rail trip per day) required to move the mercury from the site would be negligible. Therefore, negligible or no impacts on ecological resources, including terrestrial and aquatic resources, wetlands, and threatened and endangered species, are anticipated.

4.5.1.10 Cultural Resources

Under Alternative 3B, new facilities and modifications to existing facilities are not required to prepare mercury for sale. Because onsite property would not be disturbed, impacts on cultural resources are not expected.

4.5.1.11 Land Use and Visual Resources

No impacts on land use and visual resources would be expected at the storage locations from which mercury would be shipped (the New Haven, Somerville, and Warren depots and Y–12) as a result of selling the mercury to a foreign mining company in order to reduce their mercury mining activities. If each of the current storage locations were to ship their mercury as soon as possible, it is estimated that it would take less than one year to transport the entire mercury stockpile to the buyer's location. Over this period, staging and loading activities would generally take place inside existing warehouses, and increased traffic flow associated with transporting mercury from each of the current mercury storage sites would be negligible to minor. Once removal of the mercury from each site is completed, the current storage facilities would be available for potential closure, disposal, or reuse.

4.5.1.12 Infrastructure

Continuing to store mercury until it is sold will have negligible impact on site infrastructure because no new construction or change in operations is anticipated. Specific impacts for this alternative would be similar to those described for Alternative 3A. However, these impacts may vary slightly from the storage location to storage location depending on the mercury removal schedule. Additionally, minor increases in gasoline and/or propane needed for operating forklifts would occur over a period of months instead of years. Similarly, the decreases in electricity and potable water usage would also be accelerated once the mercury is sold and removed from storage.

Transport of the mercury would result in negligible, short-term increases in traffic along the roads and rails leading to and from the four storage locations. Transportation associated with the alternative to sell mercury in order to reduce mercury mining would require a total of 308 shipments over a period of 91 days (see Appendix C). This amounts to approximately 2 shipments per day from each storage location. If the mercury were moved by rail, approximately 156 shipments would be required (see Appendix C).

4.5.1.13 Environmental Justice

As described in Chapter 3, minority and low-income populations are not concentrated near the New Haven, Somerville, and Warren depots. Therefore, no disproportionately high and adverse effects are expected on minority and low-income populations near these sites.

As described in Appendix C (see Table C–3) under the alternative for sales to reduce mercury mining, mercury would be shipped from Y–12 over a period of approximately 25 days. The potential risks to minority and low-income populations near Y–12 would be short-term and would cease once the mercury was removed. Because the changes in employment would be very small (see Section 4.5.1.3), there would be no disproportionately high and adverse effects on minority and low-income populations.

4.5.2 Impacts on Mining

4.5.2.1 Domestic Mine Production

Domestic primary mercury mining began in the United States around 1850 and produced as much as 2,976 tons (2,700 metric tons) annually before all such mining ended in 1991 (BoM 1994:7; USGS 2000:10). Based upon data from the last two years in which primary mercury was mined in the United States (1989 and 1990), approximately 15 percent (80 tons [73 metric tons]) of the primary mercury mined annually was lost to the environment through the milling and roasting processes used to remove the material from the raw ore (BoM 1994:22, 24; USGS 2000:19). Since that time, U.S. mine production of mercury has only occurred as a byproduct at some gold mines, and this production has been limited to very small quantities from fewer than 10 mines in California, Nevada, and Utah. Nearly all of the current domestic production of mercury, annually estimated at approximately 441 tons (400 metric tons) in 1998 and 1999, is from the recycling of old scrap material (UNEP 2002:93; USGS 2001:104, 108).

Because primary mercury mining no longer takes place in the United States, this MM EIS assumes that sale of DNSC stockpile mercury under Alternative 3B would only be to a foreign mining company.

4.5.2.2 Impacts on World Mercury Mining

Most dedicated mine production of primary mercury presently occurs in Kyrgyzstan, Spain, Algeria, and China. Overall, global production of primary mercury has steadily decreased over the past 20 years. In 1999 and 2000, this production was estimated at 1,984 tons (1,800 metric tons), representing less than one-third of the annual primary production levels recorded in the 1980's (UNEP 2002:89).

Just as sales of DNSC stockpile mercury at the maximum allowable market rate (see Section 4.4) would have negligible impact on the global mercury market, sales to reduce mining under Alternative 3B should similarly not affect the global availability or price of mercury. The overseas mining company to which the DNSC mercury stockpile would be sold would be required to reduce its mined production of primary mercury accordingly. As a result, the available supply of mercury to global users would not be expected to change. Except for the effects at the mine accepting the DNSC mercury, it is expected that this alternative would not impact world mercury mining.

4.5.2.3 Impacts on Artisanal Gold Mining

In order to extract gold from ore deposits, artisanal gold mining operations typically employ a crude mercury amalgamation process that releases approximately 2.2 lb (1 kg) of mercury into the environment for every 2.2 lb (1 kg) of gold produced, resulting in substantial mercury contamination of air, water, and land resources (USGS 2000:36). Because the sale of DNSC stockpile mercury under Alternative 3B should not affect the price and availability of mercury, it should similarly not foster increased artisanal mining or influence the environmental impacts associated with such mining. Therefore, it is expected that this alternative would result in negligible to no impacts on artisanal gold mining.

4.5.3 Impacts at a Mercury Mining Company

It is assumed that the mercury would be stored at the mercury mining company until resold, filling orders. It is also assumed that the mercury would be shipped in the overpack drums and stored in a manner similar to that used by DNSC as described in Chapter 2. The impacts of storage at the mercury mining company are expected to be similar to the impacts of storage under the Consolidated Storage Alternatives. A wide range of environmental conditions are represented by the six potential sites evaluated in this MM EIS. Therefore, the potential impacts of storage at the mercury mining company are likely to be bounded by the Consolidated Storage Alternative evaluated in this MM EIS.

In addition, mercury mining and refining activities are likely to have a much greater impact on the environment than the storage of mercury in sealed containers. It is estimated that mercury mining emits 300 lbs (136 kg) of mercury to the environment for every 1 ton (0.9 metric ton) of mercury recovered (BoM 1994:22, 24; USGS 2000:19). Mercury mining and processing result in mercury exposure to miners, refiners, and processors, and also expose workers to the general physical and chemical hazards associated with mining and refining (Warlick 1995:8). Investigations of primary mercury mining operations in Asia show mercury contamination of water and soil, and airborne concentrations 10 to 100 times background values (EPA 2000:174). Similar studies of former mercury mining sites in Spain also show elevated concentrations of mercury and arsenic in soils and herbaceous plants, as well as high levels of arsenic in waters downstream of the mining areas (EPA 2000:179). Mine tailings often contain toxic compounds and may be the source of acid mine drainage. Emissions from mercury mining and refining may affect mine workers, and people, plants, and animals living near these facilities. Therefore, impacts from the storage of mercury are likely to be a small fraction of the impacts from mining and refining operations. Because, by definition, this alternative would result in reduced mining, this alternative would result in a moderate, long-term beneficial impact at the mercury mining company. Since elemental mercury vapor can travel long distances, reducing mercury mining may also have a minor beneficial impact on reducing the global pool of mercury.

It is possible that reduced mining could result in some mine workers losing their jobs. This could have an adverse socioeconomic effect in the communities where these workers live. However, without knowledge of the number of employees furloughed, the size of the communities where the furloughed workers reside, and the unemployment rates in those communities, it is not possible to estimate the degree of adverse impact produced by reducing mine employment.

4.5.4 Impacts at Mercury Users' Locations

Under the two Sales Alternatives, mercury would be sold directly or indirectly to users where the mercury would be employed in commercial processes. Because changes to the supply or cost of mercury on the world mercury market are expected to be negligible under either Sales Alternative, it is anticipated that users would continue their commercial processes as before, and would not be expected to use more or less mercury because of DNSC mercury sales. Therefore, it is likely that there would be no additional impact at the users' locations due to implementation of either of the DNSC mercury Sales Alternatives.

4.6 DECONTAMINATION AND DECOMMISSIONING

Under all the alternatives, mercury management facilities could eventually be decontaminated and decommissioned from mercury management uses. Sites that would be decontaminated and decommissioned under each alternative are shown in Table 4.6–1. Although the No Action and Consolidated Storage Alternatives do not include removal of mercury from all existing storage facilities during the 40-year time period addressed in this MM EIS, these facilities could eventually be decontaminated and decommissioned. Under the Consolidated Storage Alternative, mercury would be removed from some of the existing storage locations, and these facilities would be decontaminated and decommissioned from mercury management uses. Under the Sales Alternative, mercury would be moved from the existing storage locations over a period of time, and then these facilities would be decontaminated and decommissioned from mercury management uses. Under the Consolidated Storage and Sales alternatives, the Y–12 storage facility may not be immediately decontaminated and decommissioned because DOE may continue to use the facility to store DOE mercury.

Table 4.6–1. Sites That Would Be Decontaminated and Decommissioned During the 40-year Period of Analysis by Alternative

Site\Alternative	No Action	Consolidated Storage	Sales
New Haven Depot	a	D&D[b]	D&D
Somerville Depot	a	D&D[b]	D&D
Warren Depot	a	D&D[b]	D&D
Y–12 National Security Complex	a	c	c
Hawthorne Army Depot	NA	a	NA
PEZ Lake Development	NA	a	NA
Utah Industrial Depot	NA	a	NA

[a] No decontamination and decommissioning activities would take place during the 40-year storage period.
[b] Decontamination and decommissioning would take place at these sites once the material is moved to the consolidation site, unless that site is chosen for consolidation.
[c] Decontamination and decommissioning would not be performed because DOE would be expected to continue to use this facility to store its own mercury.
Key: D&D, decontaminated and decommissioned; NA, not applicable to this alternative.

Mercury storage facilities currently in use would be decontaminated and decommissioned from mercury storage use and released for other storage uses or disposition. A study of warehouses at the Binghamton Depot near Binghamton, New York, showed that removal of the mercury in November 2000 reduced mercury vapor concentrations to between 2.5 and 40 ng/m^3, well below the 25,000 ng/m^3 DNSC action level and the 300 ng/m^3 EPA long-term exposure limit for members of the general public (Graney 2001b:6). None of the warehouses used for mercury management is known to have major contamination. Therefore, major renovation, such as removal of the floor or walls, is not expected to be necessary.

Once the mercury inventory is removed from a facility, the warehouse would be inspected for residual mercury contamination, and cleaned with a mercury absorbing cleaner. Although it is likely that much less waste would be generated during decontamination, DNSC estimates that a maximum of 3 tons (2.7 metric tons) of hazardous waste could be generated at the Somerville Depot and 2 tons (1.8 metric tons) at the other sites. Decontamination of a 200,000 ft^2 (18,581 m^2) warehouse used for consolidated storage, would be expected to generate less than 8 tons (7.2 metric tons) of hazardous waste. The contaminated debris removed from the warehouse, cleaning wastes, contaminated personal protective equipment, and other contaminated materials used for cleanup would be transported off site to a commercial hazardous waste management facility for mercury recovery, recycling, and/or disposal. Decontamination and decommissioning (D&D) activities are expected to occur mostly inside the warehouses, except for the transport of wastes, and is expected to result in negligible air or water emissions. The cleaning procedure is designed to minimize the release of any material to the air or water (i.e., mercury or cleaning material). Workers performing the cleanup wear appropriate personal protective gear, including disposable coveralls and air filtration systems. Therefore, air and water quality impacts from D&D are expected to be minor and human health risks to be low. Because the shipment of wastes from D&D will be limited to a few trucks, impacts on traffic and transportation are expected to be negligible. There are expected to be no impacts on noise, socioeconomics, geology and soils, water resources, ecological resources, cultural and paleontological resources, land use and visual resources, and infrastructure.

Further analysis of alternatives for D&D of mercury storage warehouses is not possible at this time because the sites have not developed plans for future use or disposal of these facilities. Reuse or disposal plans would be the subject of additional environmental analysis, as necessary.

4.7 CUMULATIVE IMPACTS

The cumulative impacts analysis has been conducted in accordance with the Council on Environmental Quality (CEQ) regulations that implement the National Environmental Policy Act (NEPA) and the CEQ handbook, *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997).

4.7.1 Methodology and Analytical Baseline

The CEQ regulations implementing NEPA define cumulative effects as "impacts on the environment which result from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain that "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." The cumulative impacts assessment is based on both geographic (spatial) and time (temporal) considerations.

Based on examination of the potential environmental effects of the No Action, Consolidated Storage, and Sales Alternatives, DNSC and other agency actions in the region, and private actions, DNSC determined the following resource areas were likely to have a potential for limited cumulative impacts and needed to be analyzed: air quality; waste management; human health risk from normal operations; transportation infrastructure; and employment, site infrastructure, and land use. Discussions of cumulative impacts for the following resources are omitted because, as described earlier in this chapter, their potential for environmental impacts would be negligible: noise, socioeconomics, geology and soils, water resources, ecological resources, cultural resources, visual resources, and environmental justice.

The methodologies used to analyze cumulative impacts for the alternatives evaluated in this MM EIS are described in more detail in Appendix E, and involve the following process:

- Baseline impacts from past and present actions were identified.
- The largest potential impacts produced by the mercury management alternatives were identified.
- Present and reasonably foreseeable future actions and the impacts of those actions were identified.

- Aggregate (cumulative) effects of the past, present and reasonably foreseeable future actions were estimated.

As described above, DNSC assessed cumulative impacts by combining the potential effects of the largest impact alternative with the effects of other past, present, and reasonably foreseeable activities in the regions of influence (ROIs). This approach produces a conservative analysis or maximum estimation of cumulative impacts. The ROIs used in the cumulative impacts analysis are the same as those described in Appendix E and used in the preceding sections of Chapter 4. The regions of influence for different resources can vary widely in extent. For example, the region of influence of ecological resources would generally be confined to the site and nearby adjacent areas, whereas the socioeconomic region of influence would include the cities and counties surrounding each site that could be affected by the proposed action. To the extent possible, future impacts are analyzed for the same timeframe (2003 to 2043) as the mercury management alternatives.

4.7.2 Potential Cumulative Actions

Actions that may contribute to cumulative impacts include on- and offsite projects conducted by government agencies, businesses, or individuals that are within the ROIs of the actions considered in this MM EIS. Information on present and future actions was gathered based on a review of city, county, state, and Federal government information as well as any known plans in the private sector. Comprehensive Environmental Response, Compensation, and Liability Act and NEPA documents were reviewed to determine if current or proposed projects could affect the cumulative impact analysis at the sites. The potential actions listed in Table 4.7–1 are those that may contribute to cumulative impacts on or in the vicinity of the sites. For those actions that are speculative, not yet well defined, or are expected to have a negligible contribution to cumulative impacts, the actions are not included in the cumulative impact estimates.

4.7.3 Cumulative Impacts by Site

Cumulative impacts are described for each site that may be affected by alternatives for mercury management. These sites include existing and potential mercury storage locations. Cumulative impacts cannot be estimated for potential purchasers of mercury under the sales alternatives because actual buyers have not been identified.

The cumulative effects analysis for the Hawthorne Army Depot and the three DNSC storage depots (i.e., New Haven, Somerville, and Warren) assumes that these locations continue their current missions over the next 40 years at current levels of employment and activity. The assumption is conservative (yields larger than expected cumulative impacts) for the DNSC depots because the inventories of most commodities are being sold off, and site employment at the DNSC depots will be reduced in conjunction with the reduced stockpile. These plans for the depots are unrelated to mercury management activities. The cumulative effects analysis for the PEZ Lake Development and Utah Industrial Depot assume site development as described in their respective Base Realignment and Closure Environmental Impact Statement (BRAC EIS) (Army 1996, 1998). The cumulative effects analysis for Y–12 uses information from the recent *Final Site-Wide EIS for the Y–12 National Security Complex (Y–12 Site-Wide EIS*) (DOE 2001).

Table 4.7–1. Actions That May Contribute to Cumulative Impacts

Site	Name of Action	Description
New Haven Depot	Defense Environmental Restoration Program	Investigation and cleanup of surface water, groundwater, soil, and sediment contamination
Somerville Depot	Defense Environmental Restoration Program	Investigation and cleanup of surface water, groundwater, soil, and sediment contamination
	Hillsborough Bypass	Widening of Route 206 and construction of Hillsborough bypass
Warren Depot	Defense Environmental Restoration Program	Investigation and cleanup of surface water, groundwater, soil, and sediment contamination
	Warren Outerbelt Freeway	Construction of the Southern Portion of the Warren Beltway
Y–12[a]	HEU Storage Mission	Construction and operation of a facility for HEU storage
	Special Materials Mission	Construction and operation of a new Special Materials Complex
	TVA electricity generating facilities	Operation of 3 electric generation facilities within 50 miles (80 km) of Y–12
	Y–12 modernization program	Construction and operation of the (1) Enriched Uranium Manufacturing Facility; (2) Lithium Operations Complex; (3) Assemble- Disassemble-Quality Evaluation Facility; (4) Depleted Uranium Operations Facility; and (5) environmental restoration and D&D activities
	Lease of land and facilities within the ETTP	Lease of land within ETTP to the East Tennessee Technology Council
	Spallation Neutron Source	Construction and operation of the Spallation Neutron Source near ORNL
	Surplus HEU disposition	Blending of HEU to low-enriched uranium for use in commercial nuclear power plants
	Treating TRU and alpha LLW	Construction, operation and D&D of the TRU Waste Treatment Facility near ORNL
	ORNL Facilities Revitalization Project	Remodel aging facilities, construct new facilities and demolish old facilities at ORNL
	Oak Ridge area infrastructure upgrades	Infrastructure upgrades in the Oak Ridge Area including: (1) transfer of the Y–12 Water Plant to the city of Oak Ridge; (2) West End utility expansion; (3) upgrading Kerr Hollow Road; and (4) construction of a I–40 connector
Hawthorne Army Depot	Defense Environmental Restoration Program	Investigation and cleanup of surface water, groundwater, soil, and sediment contamination
PEZ Lake Development	Reuse	Redevelopment of site for multiple uses including warehousing, offices, law enforcement, jail and/or prison, etc.
	County Public Safety Building and Jail	Development of a Seneca County Public Safety Building and Jail on adjacent property to the east.
Utah Industrial Depot	Reuse	Redevelopment of the site for multiple uses including warehousing, retail, offices, residential, and hotels.
	Mid-Valley Highway	Construction of the Mid-Valley Highway to the east of the depot connecting state Routes 112 and 96
	West Loop Road	Construction of the Utah Industrial Depot West Loop Road

[a] DOE 2001:6-1–6-6.

Key: D&D, decontamination and decommissioning; ETTP, East Tennessee Technology Park; HEU, highly enriched uranium; LLW, low-level waste; ORNL, Oak Ridge National Laboratory; TRU, transuranic; TVA, Tennessee Valley Authority.

4.7.3.1 New Haven Depot

For the New Haven Depot, Alternative 2A (Consolidated Storage at the New Haven Depot) would be the bounding alternative. Table 4.7–1 lists activities near the sites that may contribute to cumulative effects. No known major activities are planned in the area around the depot (outside the site boundary) that are likely to produce cumulative impacts (Royse 2001).

4.7.3.1.1 Air Quality

Cumulative air quality impacts associated with mercury management and other site activities are not expected to substantially differ from existing baseline conditions at the New Haven Depot. As described in Sections 3.2.1.2 and 3.2.9.1, the New Haven Depot is in a rural and largely agricultural area with few nearby sources of air pollution and few air quality issues. Dust may occasionally be elevated when strong winds pass over dry fields. Because stockpiled materials that are stored outdoors are either covered or do not contain small particles that could become airborne, depot activities are not expected to contribute to cumulative suspended particulate concentrations.

As described in Section 4.3.1, the air quality impacts from mercury management activities at the New Haven Depot would be minor. The New Haven Depot is currently in compliance with all Federal, state, and local regulations and guidelines, and would continue to remain in compliance even with consideration of the cumulative effects of mercury management activities. Therefore, the overall contribution to cumulative air quality impacts from mercury management activities is expected to be negligible.

4.7.3.1.2 Waste Management

Cumulative waste management impacts focus on the maximum volumes of waste that are expected to be generated from mercury management and other site activities over the 40-year timeframe of the proposed action. As shown in Table 4.7–2, the majority of hazardous waste generated at the New Haven Depot during that timeframe would result from mercury management activities. Specifically, this hazardous waste would be associated with the one-time potential replacement of any leaking flasks during the last year of storage (see Section 4.3.2) and could represent a minor, short-term contribution to cumulative impacts. In contrast, mercury management activities would account for only a small portion of the total nonhazardous wastes generated at the New Haven Depot, and would represent a negligible contribution to cumulative impacts. However, both hazardous and nonhazardous wastes are routinely sent to treatment and/or disposal facilities, and are not accumulated on site for a significant period of time. Therefore, long-term storage of these wastes would not be required. Although planned Defense Environmental Restoration Program activities identified in Table 4.7–1 could also generate additional volumes of waste, the amount of waste generated by such a program at the New Haven Depot is not yet defined.

Table 4.7–2. Cumulative Waste Generation at the New Haven Depot Over a 40-Year Period

Waste Type	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]
Hazardous (lbs)	4,000	9,560	14,000
Nonhazardous			
Liquid (gal)	2,380,000	414,120	2,790,000
Solid (yd^3)	4,000	18	4,000

[a] This is 40 times the annual volumes presented in Chapter 3, Section 3.2.2 of this MM EIS.
[b] From Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.

4.7.3.1.3 Human Health Risk

Cumulative impacts from human exposure to mercury and other toxic compounds are presented in the form of Hazard Quotients, also known as benchmark ratios. The benchmark ratio represents the ratio of the mercury concentration to the applicable human health limit. If a benchmark ratio is greater than 1, then human health may be adversely affected from exposure to the material. As described in the *Draft Risk Assessment Report*, the benchmark ratio associated with mercury exposure of an onsite worker or a member of the public from mercury management activities at the New Haven Depot would be 0.0009 or 0.1, respectively (DLA 2003:4-3). No mercury exposures would occur as a result of other site activities. Because synergistic adverse effects to human health may occur if a person is exposed to more than one hazardous material, compounds other than mercury were also investigated. However, there is no evidence that significant emissions of other hazardous compounds occur at the New Haven Depot, and therefore no synergistic effects were identified. Because no additional mercury exposures would result from other site activities and no synergistic effects have been identified, the cumulative human health risk at the New Haven Depot is not expected to exceed the level of risk described for Alternative 2A.

4.7.3.1.4 Transportation Infrastructure

Cumulative transportation impacts at the New Haven Depot would be equal to the combined impacts from existing storage activities and those associated with Alternative 2A. Alternative 2A would result in 536 truck trips (or 268 rail trips) over a period of 91 days to consolidate the mercury at the New Haven Depot, and 8 truck trips during the last year of storage for maintenance and cleanup (see Appendix C). This amounts to approximately six vehicle trips per day during the peak transportation period. This would add to the average of 20 to 30 vehicle trips per day that are expected to occur due to other activities at the New Haven Depot (Cangro 2002), to produce a cumulative total of 26 to 36 trips. The trips associated with mercury management activities would occur over a 3-month (91-day) period, and would represent a negligible short-term contribution to cumulative impacts. No other actions at the New Haven Depot have been identified that would contribute additional cumulative transportation impacts.

4.7.3.1.5 Employment, Site Infrastructure, and Land Use

Cumulative employment, site infrastructure and land use requirements associated with mercury management and other site activities at the New Haven Depot are presented in Table 4.7–3. Approximately two additional employees would be needed to perform mercury management activities, and projected electrical power, water supply, and land requirements would not exceed the New Haven Depot's total site capacity. As such, mercury management activities would represent a negligible contribution to cumulative impacts on these resources. Although planned Defense Environmental Restoration Program activities identified in Table 4.7–1 could also affect these resource areas, the specific future requirements associated with implementation of such a program at the New Haven Depot are not yet defined.

Table 4.7–3. Maximum Cumulative Employment, Site Infrastructure, and Land Use Requirements at the New Haven Depot

Resource	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]	Total Site Capacity[d]
Site employment (FTE)	13	~2	15	NA
Electrical consumption (MWh/yr)	1,368	20	1,388	3,500
Water usage (gal/yr)	36,500	9,415	45,900	42,000,000
Occupied land (acres)	19	5.0	24	268

[a] Baseline depot storage activities as defined in Chapter 3, Sections 3.2.3 and 3.2.10 of this MM EIS.
[b] From Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[d] As defined in Chapter 3, Sections 3.2 and 3.2.10 of this MM EIS.
Key: FTE, full time equivalent; NA, not applicable.

4.7.3.2 Somerville Depot

For the Somerville Depot, Alternative 2B (Consolidated Storage at the Somerville Depot) would be the bounding alternative. Table 4.7–1 lists activities near the sites that may contribute to cumulative effects. The major activity that may contribute to cumulative impacts in the area around the depot (outside the site boundary) is the widening of portions or U.S. Highway 206 and the construction of a 4.1-mi (6.6-km) long bypass around Hillsborough. Construction of the 138-ft (42-m) wide right-of-way for the bypass would result in the disturbance of approximately 69 acres (28 ha) of land. Widening portions of Route 206 is currently underway; the bypass is scheduled for construction from 2006 to 2007. (NJDOT 1999, 2002).

Increased development in the region is the dominant factor affecting cumulative impacts. Forested and agricultural lands are increasingly being converted to housing developments, office parks and commercial strips, and the roadways and parking lots that accompany them. Development results in reduced and fragmented habitats for plants and animals, increased volumes of municipal solid waste and sewage, increased traffic, and increased air pollutant emissions from building heating and cars and trucks. Increased development can be measured indirectly by population increases. As noted in Section 3.3.3.2, between 1990 and 2000, the population in Somerset County increased by 23.8 percent compared to the overall growth rate for New Jersey of 8.9 percent. As described in Section 4.3, overall impacts from mercury management activities at the Somerville Depot would be negligible, and would represent a negligible contribution to the impacts from increased development in the area.

4.7.3.2.1 Air Quality

Cumulative air quality impacts associated with mercury management and other site activities are not expected to substantially differ from existing baseline conditions at the Somerville Depot. As described in Sections 3.3.1.2 and 3.3.9.1, the Somerville Depot is in a suburban area with few nearby sources of air pollution and few air quality issues except those associated with vehicle emissions and ozone. It is expected that the U.S. Highway 206 bypass would have a long-term beneficial impact on local air quality by reducing travel times thereby reducing vehicle emissions. Regional development is expected to have an impact on air quality by increasing the burning of fuels for heating and transportation, and reducing the area covered by trees and plants. Because there would be relatively few vehicle trips associated with

Alternative 2B (see Section 4.3.1), depot activities are expected to represent a negligible contribution to cumulative vehicle emissions and ozone pollution.

As described in Section 4.3.1, the air quality impacts from mercury management activities at the Somerville Depot would be minor. The Somerville Depot is currently in compliance with all Federal, state, and local regulations and guidelines, and would continue to remain in compliance even with consideration of the cumulative effects of mercury management activities. Therefore, the overall contribution to cumulative air quality impacts from mercury management activities is expected to be negligible.

4.7.3.2.2 Waste Management

Cumulative waste management impacts focus on the maximum volumes of waste that are expected to be generated from mercury management and other site activities over the 40-year timeframe of the proposed action. As shown in Table 4.7–4, a portion of the hazardous waste generated at the Somerville Depot during that timeframe would result from mercury management activities. Specifically, this hazardous waste would be associated with the one-time potential replacement of any leaking flasks during the last year of storage (see Section 3.2) and could represent a minor, short-term contribution to cumulative impacts. In contrast, mercury management activities would account for a small portion of the total nonhazardous wastes generated at the Somerville Depot, and would represent a negligible contribution to cumulative impacts. Both hazardous and nonhazardous wastes are routinely sent to treatment and/or disposal facilities, and are not accumulated on site for a significant period of time. Therefore, long-term storage of these wastes would not be required. Although planned Defense Environmental Restoration Program activities identified in Table 4.7–1 could also generate additional volumes of waste, the amount of waste generated by such a program at the Somerville Depot is not yet defined.

Table 4.7–4. Cumulative Waste Generation at the Somerville Depot Over a 40-Year Period

Waste Type	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]
Hazardous (lb)	21,600	9,560	31,200
Nonhazardous			
Liquid (gal)	2,908,000	414,120	3,322,000
Solid (yd^3)	6,000	18	6,000

[a] This is 40 times the annual volumes presented in Chapter 3, Section 3.3.2 of this MM EIS.
[b] From Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.

4.7.3.2.3 Human Health Risk

Cumulative impacts from human exposure to mercury and other toxic compounds are presented in the form of a HQ, also known as the benchmark ratio. The benchmark ratio represents the ratio of the mercury concentration to the applicable human health limit. If a benchmark ratio is greater than 1, then human health may be adversely affected from exposure to the material. As described in the *Draft Risk Assessment Report* the benchmark ratio associated with mercury exposure of an onsite worker or a member of the public from mercury management activities at the Somerville Depot would be 0.002 or 0.3, respectively (DLA 2003:4-3). No mercury exposures would occur as a result of other site activities. Because synergistic adverse effects to human health may occur if a person is exposed to more than one hazardous material, compounds other than mercury were also investigated. However, there is no evidence that significant emissions of other hazardous compounds occur at the Somerville Depot, and therefore no synergistic effects were identified. Because no additional mercury exposures would result from other site activities and no synergistic effects have been identified, the cumulative human health risk at the Somerville Depot is not expected to exceed the level of risk described for Alternative 2B.

4.7.3.2.4 Transportation Infrastructure

It is expected that the Highway 206 bypass would have a long-term beneficial impact on local transportation by reducing travel times and decreasing traffic congestion. Unless road construction keeps pace with regional development, it is expected that continued development will have an adverse impact on transportation by increasing traffic congestion on the roads.

Cumulative transportation impacts at the Somerville Depot would be equal to the combined impacts from existing storage activities and those associated with Alternative 2B. Alternative 2B would result in 252 truck trips (or 126 rail trips) over a period of 25 days to consolidate the mercury at the Somerville Depot, and 8 truck trips during the last year of storage for maintenance and cleanup (see Appendix C). This amounts to approximately 10 vehicle trips per day during the peak transportation period. This would add to the average of 36 vehicle trips per day that are expected to occur due to other activities at the Somerville Depot to produce a cumulative total of 46 trips (Cangro 2002). The trips associated with mercury management activities would occur over a 25-day period and therefore would represent a negligible short-term contribution to cumulative impacts. No other actions at the Somerville Depot have been identified that would contribute additional cumulative transportation impacts.

4.7.3.2.5 Employment, Site Infrastructure, and Land Use

Increased regional development is expected to increase the local population and therefore increase the local workforce. Increased regional development could also place additional strain on the local infrastructure, but would likely produce upgrades to the infrastructure to keep pace with the development. Over time, development could significantly reduce the amount of land available for future uses.

Cumulative employment, site infrastructure and land use requirements associated with mercury management and other site activities at the Somerville Depot are presented in Table 4.7–5. Approximately two additional employees would be needed to perform mercury management activities, and projected electrical power, water supply, and land requirements would not exceed the Somerville Depot's total site capacity. As such, mercury management activities would represent a negligible contribution to cumulative impacts on these resources. Although planned Defense Environmental Restoration Program activities identified in Table 4.7–1 could also affect these resource areas, the specific future requirements associated with implementation of such a program at the Somerville Depot are not yet defined.

Table 4.7–5. Maximum Cumulative Employment, Site Infrastructure, and Land Use Requirements at the Somerville Depot

Resource	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]	Total Site Capacity[d]
Site employment (FTE)	17	~1	18	NA
Electrical consumption (MWh/yr)	989	15	1,004	ND
Water usage (gal/yr)	10,400	4,415	14,800	788,400,000
Occupied land (acres)	13.8	4.6	18.4	77

[a] Baseline depot storage activities as defined in Chapter 3, Sections 3.3.3 and 3.3.10 of this MM EIS.
[b] As defined in Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[d] As defined in Chapter 3, Sections 3.3 and 3.3.10 of this MM EIS.
Key: FTE, full-time equivalent; NA not applicable; ND, no data.

4.7.3.3 Warren Depot

For the Warren Depot, MM EIS Alternative 2C (Consolidated Storage at the Warren Depot) would be the bounding alternative. Table 4.7–1 lists activities near the sites that may contribute to cumulative effects. The only major activity in the area around the depot (outside the site boundary) that may contribute to cumulative impacts is the proposed southern leg of the Warren Outerbelt Freeway. This road would pass close to the northern portion of the depot, although currently there are no firm plans to complete this roadway (Newbrough 2001).

4.7.3.3.1 Air Quality

On a regional basis the southern leg of the Warren Outerbelt Freeway would likely have a long-term, beneficial impact on air quality by reducing vehicle travel times thereby reducing vehicle emissions. On a local level, the Freeway may actually increase pollutant concentrations, by sending more traffic through the area near the Warren Depot. However, cumulative air quality impacts associated with mercury management and other site activities are not expected to substantially differ from existing baseline conditions at the Warren Depot.

As described in Section 3.4.9.1, the Warren Depot is in an area with some nearby heavy industry, including the WCI Steel Plant to the north. As described in Section 4.3.1, the air quality impacts from mercury management activities at the Warren Depot would be minor. Emissions from activities at the Warren Depot would be very small in relation to emissions from nearby industries. The Warren Depot is currently in compliance with all Federal, state, and local regulations and guidelines, and would continue to remain in compliance even with consideration of the cumulative effects of mercury management activities. Therefore, the overall contribution to cumulative air quality impacts from mercury management activities are expected to would be negligible.

4.7.3.3.2 Waste Management

Cumulative waste management impacts focus on the maximum volumes of waste that are expected to be generated from mercury management and other site activities over the 40-year timeframe of the proposed action. As shown in Table 4.7–6, approximately half of the hazardous waste generated at the Warren Depot during that timeframe would result from mercury management activities. Specifically, this hazardous waste would be associated with the one-time potential replacement of any leaking flasks during the last year of storage (see Section 4.3.2) and could represent a minor short-term contribution to cumulative impacts. In contrast, mercury management activities would account for only a small portion of the total nonhazardous wastes generated at the Warren Depot, and would represent a negligible contribution to cumulative impacts. However, both hazardous and nonhazardous wastes are routinely sent to treatment and/or disposal facilities, and are not accumulated on site for a significant period of time. Therefore, long-term storage of these wastes would not be required. Although planned Defense Environmental Restoration Program activities identified in Table 4.7–1 could also generate additional volumes of waste, the amount of waste generated by such a program at the Warren Depot is not yet defined.

Table 4.7–6. Cumulative Waste Generation at the Warren Depot Over a 40-Year Period

Waste Type	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]
Hazardous (lbs)	9,600	9,560	19,200
Nonhazardous			
Liquid (gal)	1,272,000	414,120	1,686,000
Solid (yd^3)	12,000	18	12,000

[a] This is 40 times the annual volumes presented in Chapter 3, Section 3.4.2 of this MM EIS.
[b] From Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.

4.7.3.3.3 Human Health Risk

Cumulative impacts from human exposure to mercury and other toxic compounds are presented in the form of HQs, also known as the benchmark ratios. The benchmark ratio represents the ratio of the mercury concentration to the applicable human health limit. If a benchmark ratio is greater than 1, then human health may be adversely affected from exposure to the material. As described in the *Draft Risk Assessment Report*, the benchmark ratio associated with mercury exposure of an onsite worker or a member of the public from mercury management activities at the Warren Depot would be 0.003 or 0.2, respectively (DLA 2003:4-3). No mercury exposures would occur as a result of other site activities. Because synergistic adverse effects to human health may occur if a person is exposed to more than one hazardous material, compounds other than mercury were also investigated. However, there is no evidence that significant emissions of other hazardous compounds occur at the Warren Depot, and therefore no synergistic effects were identified. Because no additional mercury exposures would result from other site activities and no synergistic effects have been identified, the cumulative human health risk at the Warren Depot is not expected to exceed the level of risk described for Alternative 2C.

4.7.3.3.4 Transportation Infrastructure

It is expected that construction of the southern leg of the Warren Outerbelt Freeway would have a long-term beneficial impact on regional transportation by reducing travel times and decreasing traffic congestion.

Cumulative transportation impacts at the Warren Depot would be equal to the combined impacts from existing storage activities and those associated with Alternative 2C. Alternative 2C would result in 534 truck trips (or 268 rail trips) over a period of 91 days to consolidate the mercury at the Warren Depot, and eight truck trips during the last year of storage for maintenance and cleanup (see Appendix C). This amounts to approximately six vehicle trips per day during the peak transportation period. This would add to the average of 20 to 40 vehicle trips per day that are expected to occur due to other activities at the Warren Depot to produce a cumulative total of 26 to 46 trips (Cangro 2002). The trips associated with mercury management activities would occur over a 3-month (91-day) period and would represent a negligible short-term contribution to cumulative impacts. No other actions at the Warren Depot have been identified that would contribute additional cumulative transportation impacts.

4.7.3.3.5 Employment, Site Infrastructure, and Land Use

Cumulative employment, site infrastructure and land use requirements associated with mercury management and other site activities at the Warren Depot are presented in Table 4.7–7. Approximately two additional employees would be needed to perform mercury management activities, and projected electrical power, water supply, and land requirements would not exceed the Warren Depot's total site capacity. As such, mercury management activities would represent a negligible contribution to cumulative impacts on these resources. Although planned Defense Environmental Restoration Program activities identified in Table 4.7–1 could also affect these resource areas, the specific future requirements associated with implementation of such a program at the Warren Depot are not yet defined.

Table 4.7–7. Maximum Cumulative Employment, Site Infrastructure, and Land Use Requirements at the Warren Depot

Resource	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]	Total Site Capacity[d]
Site employment	13	~2	15	NA
Electrical consumption (MWh/yr)	416	20	436	ND
Water usage (gal/yr)	44,800	9,400	54,200	262,800,000
Occupied land (acres)	27.6	4.6	32.2	160

[a] Baseline depot activities as defined in Chapter 3, Sections 3.4.3 and 3.4.10 of this MM EIS.
[b] From Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[d] As defined in Chapter 3, Sections 3.4 and 3.4.10 of this MM EIS.
Key: NA, not applicable; ND, no data.

4.7.3.4 Y–12

Cumulative impacts at Y–12 were recently evaluated in detail in the *Y–12 Site-Wide EI*S (DOE 2001). The cumulative impacts analysis in the *Y–12 Site-Wide EIS* was used to obtain information on the past, present, and reasonably foreseeable future activities in the region around Y–12.

For Y–12, Alternative 1 (No Action) would be the bounding alternative, except for transportation, where the Sales Alternatives would be considered to be bounding. The No Action Alternative calls for continued storage of mercury at Y–12 for up to 40 years.

4.7.3.4.1 Air Quality

Cumulative air quality impacts associated with mercury management and other site activities are not expected to substantially differ from existing baseline conditions at Y–12. As described in Section 3.5.9.1, Y–12 is an industrial site located in a rural area. As described in Section 4.2.4.1, the air quality impacts from mercury management activities at Y–12 would be negligible. Emissions from mercury management activities would be very small in relation to emissions from other activities at Y–12.

Y–12 is currently in compliance with all Federal, state, and local regulations and guidelines, and would continue to remain in compliance even with consideration of the cumulative effects of mercury management activities.

4.7.3.4.2 Waste Management

Cumulative waste management impacts focus on the maximum volumes of waste that are expected to be generated from mercury management and other site activities over the 40-year timeframe of the proposed action. As shown in Table 4.7–8, only a very small amount of the hazardous waste generated at Y–12 during that timeframe would result from mercury management activities. Specifically, this hazardous waste would be associated with the one-time potential replacement of any leaking flasks during the last year of storage (see Section 4.2.4.2). Similarly, mercury management activities would also contribute only a small portion of the total nonhazardous wastes generated at Y–12. Both hazardous and nonhazardous wastes would represent a negligible contribution to cumulative impacts. Both are routinely sent to treatment and/or disposal facilities, and are not accumulated on site for a significant period of time. Therefore, long-term storage of these wastes would not be required.

Table 4.7–8. Cumulative Waste Generation at Y–12 Over a 40-Year Period

Waste Type	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]
Hazardous (lb)	5,740,000	1,500	5,740,000
Nonhazardous			
Liquid (gal)	42,603,920	1,960	42,605,880
Solid (yd^3)	1,538,800	2.8	1,538,800

[a] DOE 2001:5-67, 6-12.
[b] From Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.

4.7.3.4.3 Human Health Risk

Cumulative impacts from human exposure to mercury and other toxic compounds are presented in the form of HQs, also known as the benchmark ratios. The benchmark ratio represents the ratio of the mercury concentration to the applicable human health limit. If a benchmark ratio is greater than 1, then human health may be adversely affected from exposure to the material. Because synergistic adverse effects to human health may occur if a person is exposed to more than one hazardous material, the benchmark ratios for the compounds are added to get the maximum cumulative health effect. Adding the benchmark ratios may overestimate adverse health effects because each compound may affect different parts of the human body.

Table 4.7–9 shows the cumulative impacts to the public from exposure at the Y–12 site boundary to hazardous materials associated with mercury management and other site activities. This table indicates that public health would not be adversely affected from exposure to these compounds.

Table 4.7–9. Cumulative Impacts to the Public from Exposure[a] to Hazardous Materials at the Y–12 Site Boundary

Compound	Hazard Quotient/Benchmark Ratio		
	Increment From Other Site Activities[b]	Increment From Mercury Management Activities[c]	Cumulative Total
Methylene biphenyl isocyanate[d]	0.164	0	0.164
Beryllium	0.0135	0	0.0135
Mercury	0.012	0.005	0.017
Total	0.1895	0.005	0.1945

[a] Exposure from breathing only.

[b] Source: DOE 2001:5-75, 5-79, D-39.

[c] As defined in the *Draft Human Health and Ecological Risk Assessment Report for the Mercury Management EIS* (DLA 2003:4-3).

[d] Analyses performed for the *Y–12 Site-Wide EIS* greatly overestimate methylene biphenyl isocyanate emissions by assuming that all of the material used is lost to the air. In practice, most of this compound is solidified with only residual vapors escaping. Monitoring at Y–12 shows that this compound is not present at concentrations of concern (Morris 2003).

Table 4.7–10 shows the potential cumulative impacts to workers within the Y–12 site from exposure to hazardous materials associated with mercury management and other site activities. This table indicates that worker health may be affected by exposure to hazardous materials under the cumulative impacts scenarios. Methylene biphenyl isocyanate would be the primary material contributing to the elevated benchmark ratio. Analyses performed for the *Y–12 Site-Wide EIS* greatly overestimate methylene biphenyl isocyanate emissions by assuming that all of the material used is lost to the air. In practice, most of this compound is solidified with only residual vapors escaping. Monitoring at Y–12 shows that this compound is not present at concentrations of concern (Morris 2003). The cumulative benchmark ratio for mercury would be 0.1803.

Table 4.7–10. Cumulative Impacts to Workers from Exposure[a] to Hazardous Materials on the Y–12 Site

Compound	Hazard Quotient/Benchmark Ratio		
	Increment From Other Site Activities[b]	Increment From Mercury Management Activities[c]	Cumulative Total
Methylene biphenyl isocyanate[d]	66.8	0	66.8
Beryllium	0.084	0	0.084
Mercury	0.18	0.0003	0.1803
Total	67.064	0.0003	67.0643

[a] Exposure from breathing only.

[b] DOE 2001:5-76, 5-79, D-39.

[c] As defined in the *Draft Human Health and Ecological Risk Assessment Report For the Mercury Management EIS* (DLA 2003:4-3).

[d] Analyses performed for the *Y–12 Site-Wide EIS* greatly overestimate methylene biphenyl isocyanate emissions by assuming that all of the material used is lost to the air. In practice, most of this compound is solidified with only residual vapors escaping. Monitoring at Y–12 shows that this compound is not present at concentrations of concern (Morris 2003).

4.7.3.4.4 Transportation Infrastructure

Cumulative transportation impacts at Y–12 could be bounded by the impacts associated with either the No Action Alternative or the Sales Alternative. The No Action Alternative would produce 320 truck trips and 160 automobile trips over the 40-year period of analysis. This amounts to an average of one vehicle trip per month. In contrast, the Sales Alternative would result in 98 truck trips over a period of 25 days, or approximately four truck trips per day (see Appendix C). However, neither mercury management alternative would appreciably add to the 3,234 vehicle trips per day on West Bear Creek Road that are expected to occur due to other site activities at Y–12 (DOE 2001:5-7, 5-11). Therefore, mercury management activities would represent a negligible contribution to cumulative transportation impacts.

4.7.3.4.5 Employment, Site Infrastructure, and Land Use

Cumulative employment, site infrastructure and land use requirements associated with mercury management and other site activities at Y–12 are presented in Table 4.7–11. Approximately one additional employee would be needed to perform mercury management activities, and projected electrical power, water supply, and land requirements would not exceed Y–12's total site capacity. As such, mercury management activities would represent a negligible contribution to cumulative impacts on these resources.

Table 4.7–11. Maximum Cumulative Employment, Site Infrastructure, and Land Use Requirements at Y–12

Resource	Increment From Other Site Activities[a]	Increment From Mercury Management Activities[b]	Cumulative Total[c]	Total Site Capacity[d]
Site employment (FTE)	9,363	<1	9,363	NA
Electrical consumption (MWh/yr)	602,050	0.197	602,050	1,752,000
Water usage (gal/yr)	1,590,000,000	261	1,590,000,000	2,555,000,000
Occupied land (acres)	256	0.1	256	811

[a] DOE 2001:4-12, 5-6, 5-11, 5-21, 5-53, 6-9.
[b] From Appendix C, Table C–1 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[d] As defined in Chapter 3, Sections 3.5 and 3.5.10 of this MM EIS.
Key: FTE, full-time equivalent; NA, not applicable.

4.7.3.5 Hawthorne Army Depot

For the Hawthorne Army Depot, Alternative 2D (Consolidated Storage at the Hawthorne Army Depot) would be the bounding alternative. Table 4.7–1 lists activities near the sites that may contribute to cumulative effects. No know major activities are planned in the area around the depot (outside the site boundary) that are likely to produce cumulative impacts (Cadwalider 2002).

4.7.3.5.1 Air Quality

Cumulative air quality impacts associated with mercury management and other site activities are not expected to substantially differ from existing baseline conditions at the Hawthorne Army Depot. As described in Sections 3.6.1.2 and 3.6.9.1, the Hawthorne Army Depot is in a rural area with few nearby sources of air pollution and few air quality issues. Some state-permitted air emissions are generated during the destruction of waste explosives. Dust may occasionally be elevated when strong winds pass over dry soils.

As described in Section 4.3.1, the air quality impacts from mercury management activities at the Hawthorne Army Depot would be minor. The Hawthorne Army Depot is currently in compliance with all Federal, state, and local regulations and guidelines, and would continue to remain in compliance even with consideration of the cumulative effects of mercury management activities. Therefore, the overall contribution to cumulative air quality impacts from mercury management activities is expected to be negligible.

4.7.3.5.2 Waste Management

Cumulative waste management impacts focus on the maximum volumes of waste that are expected to be generated from mercury management and other site activities over the 40-year timeframe of the proposed action. As shown in Table 4.7–12, a portion of the hazardous waste generated at the Hawthorne Army Depot during that timeframe would result from mercury management activities. Specifically, this hazardous waste would be associated with the one-time potential replacement of any leaking flasks during the last year of storage (see Section 4.3.2). Mercury management activities would also contribute only a small portion of the total nonhazardous wastes generated at the Hawthorne Army Depot. Both hazardous and nonhazardous wastes are routinely sent to offsite treatment and disposal facilities, and would represent a negligible short-term contribution to cumulative impacts. Some explosive hazardous wastes are stored and treated on site.

Table 4.7–12. Cumulative Waste Generation at the Hawthorne Army Depot Over a 40-Year Period

Waste Type	Increment from Other Site Activities[a]	Increment from Mercury Management Activities[b]	Cumulative Total[c]
Hazardous (lbs)	4,183,600	9,560	4,193,200
Nonhazardous			
Liquid (gal)	260,000,000	414,120	260,000,000
Solid (yd^3)	354,960	18	354,980

a This is 40 times the annual volumes presented in Chapter 3, Section 3.6.2 of this MM EIS.
b From Appendix C, Table C–2 of this MM EIS.
c Some totals may not appear to add because rules of rounding and significant figures have been applied.

4.7.3.5.3 Human Health Risk

Cumulative impacts from human exposure to mercury and other toxic compounds are presented in the form of HQs, also known as the benchmark ratios. The benchmark ratio represents the ratio of the mercury concentration to the applicable human health limit. If a benchmark ratio is greater than 1, then human health may be adversely affected from exposure to the material. As described in the *Draft Risk Assessment Report* the benchmark ratio associated with mercury exposure of an onsite worker or a member of the public from mercury management activities at the Hawthorne Army Depot would be 0.00002 or 0.004, respectively (DLA 2003:4-3). No mercury exposures would occur as a result of other site activities. Since synergistic adverse effects to human health may occur if a person is exposed to more than one hazardous material, compounds other than mercury were also investigated. However, there is no evidence that significant emissions of other hazardous compounds occur at the Hawthorne Army Depot, and therefore no synergistic effects were identified. Because no additional mercury exposures would result from other site activities and no synergistic effects have been identified, the cumulative human health risk at the Hawthorne Army Depot is not expected to exceed the level of risk described for Alternative 2D.

4.7.3.5.4 Transportation Infrastructure

Cumulative transportation impacts at the Hawthorne Army Depot would be equal to the combined impacts from existing storage activities and those associated with Alternative 2D. Alternative 2D would result in 616 truck trips (or 308 rail trips) over a period of 91 days to consolidate the mercury at the Hawthorne Army Depot, and 8 truck trips during the last year of storage for maintenance and cleanup (see Appendix C). This amounts to approximately seven vehicle trips per day during the peak transportation period. This would be a small addition to the average of 360 vehicle trips per day that are expected to occur due to other activities at the Hawthorne Army Depot (Downs 2002b). The trips associated with mercury management activities would occur over a 3-month (91-day) period and would represent a negligible short-term contribution to cumulative impacts. No other actions at the Hawthorne Army Depot have been identified that would contribute additional cumulative transportation impacts.

4.7.3.5.5 Employment, Site Infrastructure, and Land Use

Cumulative employment, site infrastructure and land use requirements associated with mercury management and other site activities at the Hawthorne Army Depot are presented in Table 4.7–13. Approximately two additional employees would be needed to perform mercury management activities, and projected electrical power, water supply, and land requirements would not exceed the Hawthorne Army Depot's total site capacity. As such, mercury management activities would represent a negligible contribution to cumulative impacts on these resources.

Table 4.7–13. Maximum Cumulative Employment, Site Infrastructure, and Land Use Requirements at the Hawthorne Army Depot

Resource	Increment From Other Site Activities[a]	Increment From Mercury Management Activities[b]	Cumulative Total[c]	Total Site Capacity[d]
Site employment (FTE)	480	2	482	NA
Gasoline consumption (gal/yr)	170,000	900	170,000	1,000[e]
Water usage (gal/yr)	82,125,000	10,767	82,136,000	567,648,000
Occupied land (acres)	171.4	4.6	176	147,236

[a] As defined in Chapter 3, Sections 3.6, 3.6.3, and 3.6.10 of this MM EIS.
[b] From Appendix C, Table C–2 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[d] As defined in Chapter 3, Sections 3.6 and 3.6.10 of this MM EIS.
[e] Capacity of one refillable aboveground storage tank.
Key: FTE, full-time equivalent; NA, not applicable.

4.7.3.6 PEZ Lake Development

For the PEZ Lake Development, Alternative 2E (Consolidated Storage at the PEZ Lake Development) would be the bounding alternative. Table 4.7–1 lists activities near the candidate sites that may contribute to cumulative effects. It is assumed that the medium-low reuse scenario described in the *Final Environmental Impact Statement for BRAC 95 Disposal and Reuse of Property at the Seneca Army Depot Activity* (*BRAC EIS for Seneca Army Depot*) (Army 1998) best matches the future plans for redevelopment of the site (Absolom 2002). Therefore, the medium-low reuse scenario is used to represent the impacts of future activities at the site. In order to include all related activities in the region, cumulative impacts are evaluated for the entire former Seneca Army Depot property rather than just the PEZ Lake Development.

A number of changes have already occurred at the former Seneca Army Depot including development of the northern portion of the depot for KidsPeace, construction of a state prison on the southern portion of the property, and sale of the base housing units to a private management firm (Jones 2002). Although still under study, the Seneca County Public Safety Building and Jail may be located on a parcel of land directly to the east of the site (Chazen 2002). These activities at the former Seneca Army Depot are considered to be part of the medium-low reuse scenario evaluated in the *BRAC EIS for Seneca Army Depot*, and are not evaluated individually in this cumulative impacts analysis. No known major activities are planned in the area outside the boundaries of the former Seneca Army Depot that are likely to produce cumulative impacts (Hanes 2002).

4.7.3.6.1 Air Quality

As described in the *BRAC EIS for Seneca Army Depot*, long-term minor adverse impacts to air quality would be expected from the medium-low reuse scenario (Army 1998:5-22). These impacts were analyzed in the *BRAC EIS for Seneca Army Depot* and found to be acceptable. As described in Section 4.3.1, the air quality impacts from mercury management activities at the PEZ Lake Development would be minor. However, the overall contribution to cumulative air quality impacts from mercury management activities is expected to be negligible and not appreciably add to the air quality impacts of the medium-low reuse scenario evaluated in the *BRAC EIS for Seneca Army Depot*.

4.7.3.6.2 Waste Management

Cumulative waste management impacts focus on the maximum volumes of waste that are expected to be generated from mercury management and other site activities over the 40-year timeframe of the proposed action. As shown in Table 4.7–14, a portion of the hazardous waste generated at the PEZ Lake Development during that timeframe would result from mercury management activities. Specifically, this hazardous waste would be associated with the one-time potential replacement of any leaking flasks during the last year of storage (see Section 4.3.2), and could represent a minor short-term contribution to cumulative impacts. In contrast, mercury management activities would account for only a small portion of the total nonhazardous wastes generated at the PEZ Lake Development and would represent a negligible contribution to cumulative impacts. Both hazardous and nonhazardous wastes would be sent to treatment and disposal facilities and not accumulated on site for a significant period of time. Therefore, long-term storage of these wastes would not be required.

As described in the *BRAC EIS for Seneca Army Depot*, adverse impacts to waste management would not be expected from the medium-low reuse scenario (Army 1998:5-31). Use of a portion of the PEZ Lake Development for mercury storage is not expected to appreciably add to the waste management impacts of the medium-low reuse scenario evaluated in the *BRAC EIS for Seneca Army Depot*.

If constructed, the nearby Seneca County Public Safety Building and Jail is expected to generate approximately 15,000 gal/day (5,475,000 gal/yr) of nonhazardous liquid waste and 4 yd^3/day (1,460 yd^3/yr) of nonhazardous solid waste (Chazen 2002:66, 67).

Table 4.7–14. Cumulative Waste Generation at the PEZ Lake Development/ Former Seneca Army Depot Over a 40-Year Period

Waste Type	Increment From Other Site Activities[a]	Increment From Mercury Management Activities[b]	Cumulative Total[c]
Hazardous (lbs)	7,500	9,560	17,100
Nonhazardous			
Liquid (gal)	9,004,880,000	414,120	9,005,290,000
Solid (yd^3)	173,600	18	173,620

[a] Waste totals are from Chapter 3 of this MM EIS and the *Supplemental Draft Environmental Impact Statement Seneca County Public Safety Building and Jail at the Seneca Army Depot Town of Romulus, Seneca County, New York* (Chazen 2002:66, 67). Liquid nonhazardous waste value estimated from medium-low reuse scenario in the *BRAC EIS for Seneca Army Depot* (Army 1998:5-31).

[b] From Appendix C, Table C–2 of this MM EIS.

[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.

4.7.3.6.3 Human Health Risk

Cumulative impacts from human exposure to mercury and other toxic compounds are presented in the form of HQs, also known as benchmark ratios. The benchmark ratio represents the ratio of the mercury concentration to the applicable human health limit. If a benchmark ratio is greater than 1, then human health may be adversely affected from exposure to the material. As described in the *Draft Risk Assessment Report,* the benchmark ratio associated with mercury exposure of an onsite worker or a member of the public from mercury management activities at the PEZ Lake Development would be 0.0006 or 0.1, respectively (DLA 2003:4-3). No mercury exposures would occur as a result of other site activities. Because synergistic adverse effects to human health may occur if a person is exposed to more than one hazardous material, compounds other than mercury were also investigated. However, there is no evidence that there are significant emissions of other hazardous compounds on the former Seneca Army Depot property, and therefore no synergistic effects were identified.

4.7.3.6.4 Transportation Infrastructure

Cumulative transportation impacts at the PEZ Lake Development would be equal to the combined impacts from existing activities and those associated with Alternative 2E. Alternative 2E would result in 616 truck trips (or 308 rail trips) over a period of 91 days to consolidate the mercury at PEZ Lake, and 8 truck trips in the last year of storage for maintenance and cleanup (see Appendix C). This amounts to approximately seven vehicle trips per day during the peak transportation period. This would be a small addition to the average of 2,040 employee and 50 truck trips per day that are expected to occur at the former Seneca Army Depot under the medium-low reuse scenario (Army 1998:5-23). The additional trips related to mercury storage would occur over a 3-month (91-day) period and would not appreciably add to the 3,600 vehicle trips per day on State Highway 96 that occur due to other activities in the region (Chazen 2002:45). Therefore, mercury management activities would represent a negligible short-term contribution to cumulative transportation impacts.

4.7.3.6.5 Employment, Site Infrastructure, and Land Use

Cumulative employment, site infrastructure and land use requirements associated with mercury management and other site activities at the former Seneca Army Depot are presented in Table 4.7–15. The former Seneca Army Depot is expected to remain within site capacity for all major resources (i.e., electrical power, water supply, and land availability). If constructed, the nearby Seneca County Public Safety Building and Jail would employ approximately 45 persons, use approximately 15,000 gal/day (5,475,000 gal/yr) of water, and would occupy 12 acres (4.9 ha) of land (Chazen 2002:4, 29, 66). As such, mercury management activities would represent a negligible contribution to cumulative impact on these resources.

Table 4.7–15. Maximum Cumulative Employment, Site Infrastructure, and Land Use Requirements at the PEZ Lake Development/Former Seneca Army Depot

Resource	Increment From Other Site Activities[a]	Increment From Mercury Management Activities[b]	Cumulative Total[c]	Total Site Capacity[d]
Site employment (FTE)	2,040	2	2,042	NA
Electrical consumption (MWh/yr)	450[e]	25.6	480	30,225[e]
Water usage (gal/yr)	225,122,040	10,767	225,132,810	328,500,000[e]
Occupied land (acres)	1,480	4.1[f]	1,480	10,594

[a] From the *BRAC EIS for Seneca Army Depot* (Army 1998:5-19, 5-31).
[b] From Appendix C of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[d] From Chapter 3 of this MM EIS.
[e] From Chapter 3 of this MM EIS; not provided in the *BRAC EIS for Seneca Army Depot* for entire former Seneca Army Depot property.
[f] Considered to be a portion of occupied land described in the *BRAC EIS for Seneca Army Depot*.
Key: FTE, full-time equivalent; NA, not applicable.

4.7.3.7 Utah Industrial Depot

For the Utah Industrial Depot, Alternative 2F (Consolidated Storage at the Utah Industrial Depot) would be the bounding alternative. Table 4.7–1 lists activities near the depot that may contribute to cumulative effects. It is assumed that the medium intensity reuse scenario described in the *Final Environmental Impact Statement Disposal and Reuse of the BRAC Parcel at Tooele Army Depot* best matches the future plans for redevelopment of the Utah Industrial Depot (*BRAC EIS for Tooele Army Depot*) (Army 1996; Smith 2002c). Therefore, the medium intensity reuse scenario is used to represent the impacts of future activities at the site.

A number of changes have already occurred at the Utah Industrial Depot including major changes to site utilities, and leasing of portions of the site for commercial and industrial uses. These activities at the Utah Industrial Depot are considered to be part of the medium intensity reuse scenario evaluated in the *BRAC EIS for Tooele Army Depot*, and are not added separately in this cumulative impacts analysis.

Impacts of construction of the Mid-Valley Highway connecting state Routes 112 and 96, and construction of a new access road (West Loop Road) for the Utah Industrial Depot are added to the medium intensity reuse scenario described in the *BRAC EIS for Tooele Army Depot* (Army 2001a, 2001b). The Mid-Valley Highway would occupy approximately 241 acres (97.5 ha) of land including 101 acres (40.9 ha) of property within the Tooele Army Depot (Army 2001a). Construction of the Mid-Valley Highway is not expected for 10 to 15 years (Smith 2002b). The West Loop Road would occupy approximately 4 acres (1.6 ha) of land and would open approximately 62 acres (25 ha) of Tooele Army Depot land for future development (Tooele Army Depot 2001).

Increased development in the region is the dominant factor affecting cumulative impacts outside the site boundary. Open and range lands are increasingly being converted to housing developments, office parks and commercial strips, and the roadways and parking lots that accompany them. Development results in reduced and fragmented habitats for plants and animals, increased volumes of municipal solid waste and sewage, increased traffic, and increased air pollutant emissions from building heating and cars and trucks. Increased development can be measured indirectly by population increases. As noted in Section 3.8.3.2, between 1990 and 2000, the population in Tooele County increased by 34.7 percent compared to the overall growth rate for Utah of 22.8 percent. The population in the Tooele Valley is expected to continue to grow at a rate of 5 percent per year (Thomas Consultants 2002). As described in Section 4.3, overall impacts from mercury management activities at the Utah Industrial Depot would be negligible, and would represent a negligible contribution to the impacts from increased development in the area.

4.7.3.7.1 Air Quality

As described in the *BRAC EIS for Tooele Army Depot*, no significant adverse impacts to air quality would be expected from the medium intensity reuse scenario except for possible localized violations of the Federal 8-hour carbon monoxide standard at major intersections along state road 112 (Army 1996:5-40). These impacts were analyzed in the *BRAC EIS for Tooele Army Depot* and found to be acceptable. As described in Sections 3.8.3.2 and 3.8.9.1, the Utah Industrial Depot is in a rural area that is under increasing pressure from development. Increased development is expected to have an adverse impact on air quality by increasing the burning of fuels for heating and transportation, and reducing the area covered by shrubs and plants. It is expected that new road construction would have a long-term beneficial impact to local air quality by reducing travel times thereby reducing vehicle emissions.

As described in Section 4.3.1, the air quality impacts from mercury management activities at the Utah Industrial Depot would be minor. However, the overall contribution to cumulative air quality impacts from mercury management activities is expected to be negligible and not appreciably add to the cumulative air quality impacts of the medium intensity reuse scenario evaluated in the *BRAC EIS for Tooele Army Depot*.

4.7.3.7.2 Waste Management

Cumulative waste management impacts focus on the maximum volumes of waste that are expected to be generated from mercury management and other site activities over the 40-year timeframe of the proposed action. As shown in Table 4.7–16, a portion of the hazardous waste generated at the Utah Industrial Depot during that timeframe would result from mercury management activities. Specifically, this hazardous waste would be associated with the one-time potential replacement of any leaking flasks during the last year of storage (see Section 4.3.2) and could represent a minor short-term contribution to cumulative impacts. In contrast, mercury management activities account for only a small portion of the total nonhazardous wastes generated at the Utah Industrial Depot, and would represent a negligible contribution to cumulative impacts. Both hazardous and nonhazardous wastes would be sent to treatment and disposal facilities, and not accumulated on site for a significant period of time. Therefore, long-term storage of these wastes would not be required.

As described in the *BRAC EIS for Tooele Army Depot*, adverse impacts to waste management would not be expected from the medium intensity reuse scenario (Army 1996:5-41, 5-42). Use of a portion of the Utah Industrial Depot for mercury storage is not expected to appreciably add to the waste management impacts of the medium intensity reuse scenario evaluated in the *BRAC EIS for Tooele Army Depot*.

Table 4.7–16. Cumulative Waste Generation at the Utah Industrial Depot Over a 40-Year Period

Waste Type	Increment from Other Site Activities	Increment from Mercury Management Activities[a]	Cumulative Total[b]
Hazardous (lbs)	ND	9,560	ND
Nonhazardous			
Liquid (gal)	5,166,720,000[c]	414,120	5,167,130,000
Solid (yd^3)	48,000[d]	18	48,000

[a] From Appendix C, Table C–2 of this MM EIS.
[b] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[c] Values for medium intensity reuse scenario in *BRAC EIS for Tooele Army Depot* (Army 1996:5-41–5-43).
[d] As described in Chapter 3, Section 3.8.2 of this MM EIS.
Key: ND, no data.

4.7.3.7.3 Human Health Risk

Cumulative impacts from human exposure to mercury and other toxic compounds are presented in the form of HQs, also known as benchmark ratios. The benchmark ratio represents the ratio of the mercury concentration to the applicable human health limit. If a benchmark ratio is greater than 1, then human health may be adversely affected from exposure to the material. As described in the *Draft Risk Assessment Report* the benchmark ratio associated with mercury exposure of an onsite worker or a member of the public from mercury management activities at the Utah Industrial Depot would be 0.00001 or 0.002, respectively (DLA 2003:4-3). No mercury exposures would occur as a result of other site activities. Because synergistic adverse effects to human health may occur if a person is exposed to more than one hazardous material, compounds other than mercury were also investigated. However, there is no evidence that significant emissions of other hazardous compounds occur at the Utah Industrial Depot, and therefore no synergistic effects were identified. Because no additional mercury exposures would result from other site activities and no synergistic effects have been identified, the cumulative human health risk at the Utah Industrial Depot is not expected to exceed the level of risk described for Alternative 2F.

4.7.3.7.4 Transportation Infrastructure

Cumulative transportation impacts at the Utah Industrial Depot would be equal to the combined impacts from existing activities and those associated with Alternative 2F. Alternative 2F would result in 616 truck trips (or 308 rail trips) over a period of 91 days to consolidate the mercury at Utah Industrial Depot, and eight truck trips in the last year of storage for maintenance and cleanup (see Appendix C). This amounts to approximately seven vehicle trips per day during the peak transportation period. This would be a small addition to the average of 4,000 vehicle trips per day that currently occur due to other activities at Utah Industrial Depot (Smith 2002c), and the 42,262 trips per day projected under the medium intensity reuse scenario (Army 1996:5-33). The additional trips related to mercury storage would occur over a 3-month (91-day) period and would represent a negligible short-term contribution to cumulative transportation impacts.

It is expected that the road construction projects would have a positive impact on transportation by reducing travel times and decreasing traffic congestion. Unless road construction keeps pace with regional development, it is expected that development could eventually have an adverse impact on transportation by increasing traffic congestion on the roads.

4.7.3.7.5 Employment, Site Infrastructure, and Land Use

Cumulative employment, site infrastructure and land use requirements associated with mercury management and other site activities at the Utah Industrial Depot are presented in Table 4.7–17. Approximately two additional employees would be needed to perform mercury management activities, and projected electrical power, water supply, and land requirements would not exceed the Utah Industrial Depot's total site capacity. As such, mercury management activities would represent a negligible contribution to cumulative impacts on these resources.

Table 4.7–17. Maximum Cumulative Employment, Site Infrastructure, and Land Use Requirements at the Utah Industrial Depot

Resource	Increment From Other Site Activities[a]	Increment From Mercury Management Activities[b]	Cumulative Total[c]	Total Site Capacity[d]
Site employment (FTE)	4,600	2	4,602	NA
Electrical consumption (MWh/yr)	34,000	25.6	34,000	66,000
Water usage (gal/yr)	239,200,000	10,767	239,200,000	525,600,000
Occupied land (acres)	936	4.1[e]	936	1,700

[a] Totals obtained from the *BRAC EIS for Tooele Army Depot* (Army 1996: 3-17, 5-27, 5-43) except for electrical consumption from Section 3.8.10.
[b] From Appendix C, Table C–2 of this MM EIS.
[c] Some totals may not appear to add because rules of rounding and significant figures have been applied.
[d] As defined in Chapter 3, Section 3.8 and 3.8.10 of this MM EIS.
[e] Considered to be a portion of occupied land described in the *BRAC EIS for Tooele Army Depot*.
Key: FTE, full time equivalent; NA, not applicable.

Increased regional development is expected to increase the local population and therefore increase the local workforce. Increased development could also place additional strain on the local infrastructure, but would likely produce upgrades to the infrastructure to keep pace with the development. Over time, development could significantly reduce the amount of land available for future uses.

4.7.4 Regional and Global

Cumulative effects may occur on a local, regional, or global level. Local cumulative effects for each site are described in Section 4.7.3. Potential regional and global cumulative impacts for mercury concentrations, transportation, ozone depletion and global warming, human health risk, and biodiversity are discussed below.

4.7.4.1 Mercury Concentrations

Background concentrations of mercury in the air around the world range from 1 to 2.5 ng/m^3 (Graney 2001a:15). Concentrations tend to be higher around population centers where the effects of man's activities are the greatest. Measurements taken in the existing mercury storage buildings have shown that the concentrations of mercury in the air range from 61 to 5,549 ng/m^3 below the 50,000-ng/m^3 Occupational Safety and Health Administration worker exposure limit (Graney 2001b:9). Measurements outside the buildings have demonstrated that mercury concentrations are quickly reduced to background as one moves away from the storage buildings (Graney 2001b:14). This indicates that the small amount of mercury released from the storage buildings is not causing an appreciable rise in regional or global concentrations of mercury. Likewise, this small amount would represent a negligible contribution to cumulative human health risk at a regional or global level.

4.7.4.2 Transportation

Vehicle trips related to the mercury management alternatives may contribute to cumulative transportation impacts. The worst-case alternative for transportation is likely to be Alternative 3B (Sales to Reduce Mercury Mining). This alternative would result in 0.3 to 2.4 million truck miles or 0.2 to 1.3 million rail miles to move the mercury from the current storage locations to the U.S. port, 2.7 to 4.5 million vessel miles to ship the mercury across the ocean, and 154,000 truck miles to move the mercury from the foreign port to the buyer's location (DLA 2003:2-12).

The 0.3 to 2.4 million truck miles would be a very small portion of the 196,380 million truck miles that are expected every year in the United States (DOT 2001:app. A). Likewise the 0.2 to 1.3 million rail miles would be a small increment of the 475 million freight miles expected every year in the United States (DOT 2001:app. A). The 4,890 tons (4,436 metric tons) of mercury sent overseas in a maximum of 308 trips would be a small portion of the 404,708,000 tons (367,143,003 metric tons) of freight exported by ship from the United States each year (DOT 2001:app. A). The 308 truck trips to move the mercury from the foreign port to the buyer's location is likely to result in only negligible cumulative impacts. Therefore, impacts on regional and global transportation are not expected.

4.7.4.3 Ozone Depletion and Global Warming

Alternatives for mercury management are not expected to use or discharge significant quantities of any ozone depleting chemicals. Building upgrades would be accomplished using materials and equipment formulated to be compliant with laws and regulations to reduce the use of ozone depleting compounds. Any release of ozone depleting compounds during operations would be incidental to the conduct of mercury management activities, such as might occur during the repair or replacement of older air conditioning systems that contain ozone depleting compounds. In any case, emissions of ozone-depleting compounds would be very small, and would represent a negligible contribution to the destruction of the earth's protective ozone layer.

Although there continues to be some debate, most scientists believe that increases in atmospheric concentrations of certain pollutants such as carbon dioxide, methane, and nitrous oxide can produce changes in the Earth-atmosphere energy balance and influence global climate. This is commonly referred to as global warming. Carbon dioxide is emitted during the burning of fossil fuels such as natural gas, oil, gasoline, and coal. As described in the air quality impacts sections, there would be little fuel burning directly associated with mercury storage. The mercury is stored in unheated buildings, although carbon dioxide is indirectly emitted when the electricity supplier burns fossil fuels to generate electricity used to light the storage buildings. As shown in the sections describing impacts to infrastructure, electricity use during storage is minimal. Therefore, emissions associated with producing this electricity are expected to represent a negligible contribution to global warming.

Carbon dioxide is also emitted from vehicle exhaust. As described in the *Draft Risk Assessment Report* (DLA 2003), Alternative 3B (Sales to Reduce Mercury Mining) would have the largest emission of this pollutant over the shortest interval; a maximum of 1,643 tons (1,490 metric tons) of carbon dioxide. This would be a very small fraction of the approximately 2,005 million tons (1,819 million metric tons) of carbon dioxide estimated to be emitted from vehicles in the United States each year (DOT 2001:Table 4-49), and therefore, would represent a negligible contribution to increased global warming.

4.7.4.4 Human Health Risk

As described above, the small amount of mercury vapor that could escape from storage buildings would not cause an appreciable rise in regional or global concentrations of mercury. As such, the small amount of mercury released would represent a negligible contribution to cumulative human health risk at a regional or global level.

4.7.4.5 Biodiversity

Alternatives involving storage of mercury would involve no new construction and little emissions of mercury (see “Mercury Concentrations” above). Therefore, there would be little chance for impacts to regional or global biodiversity.

As described above in Section 4.7.4.2, the alternative that would produce the most transportation impacts would be the “Sales to Reduce Mercury Mining Alternative.” Since transportation related to the mercury management alternatives is expected to represent a negligible contribution to regional or global transportation impacts, it is likewise expected to represent a negligible contribution to the reduction of regional or global biodiversity.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments of resources for each alternative, including the No Action Alternative, potentially would include the commitment of land and material resources during the life of the project and energy and water used in operating a mercury storage facility. The commitments of capital, energy, labor, and materials during the implementation of the alternatives generally would be irreversible. Commitment of these resources to support the storage or sale of mercury would make them unavailable for other purposes. Capital would be committed permanently. The commitment of equipment and labor would be only for the duration of the project. The Sales Alternative would have the least commitment of land, materials, and energy resources.

4.8.1 Land Use

Operation of existing storage facilities would not require the irreversible or irretrievable commitment of land. Nor would it alter existing land use at the proposed sites. The use of this land would be required for the duration of the project and could be reversed and retrieved for other uses after the storage facility is decontaminated and decommissioned. See Section 4.6 for the impacts of D&D.

4.8.2 Materials

The implementation of the alternatives considered in this MM EIS, including the No Action Alternative, would require the purchase of material resources including electricity, coal, gasoline, natural gas, propane, fuel oil, and water. During operation of the storage facilities, water at all sites would be obtained as much as possible from existing onsite sources. Electricity, coal, gasoline, natural gas, propane, and fuel oil would be purchased from commercial sources. These commodities are readily available and the amounts required would not have an appreciable impact on available supplies or capacities. Certain materials and equipment used during operation of the storage facilities could be recycled when the facilities are decontaminated and decommissioned. See Appendix C for a discussion of material requirements for each alternative.

4.8.3 Energy

Energy expended directly or indirectly to support the storage of mercury would be in the form of fuel for equipment and vehicles, electricity for facility operation and economic and human labor. The energy consumption of fuel and electricity during operation of mercury storage facilities would be an irretrievable commitment of these nonrenewable resources. It would, however, be a small fraction of the total energy available at each site. The energy consumed would be unavailable for other uses. See Appendix C for a discussion of energy requirements for each alternative.

4.8.4 Waste

Storage operations at any proposed facility would generate nonrecyclable waste streams, such as solid waste and some wastewater. The treatment and disposal of any waste also would cause irreversible and irretrievable commitments of materials, energy resources, and landfill space. Hazardous waste disposal would irreversibly and irretrievably commit land for its disposal. This space would be unavailable for wastes from other sources.

4.9 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The use of land for mercury storage at existing mercury storage locations and at candidate consolidated storage locations would constitute short-term uses of the environment. Upon completion of mercury management activities at any of these locations, land could be returned to other uses, including long-term productive uses. Disposal of mercury packaging wastes (including contaminated drums and flasks) would occur at commercial facilities that commonly perform these types of activities. Although disposal of these materials could contribute to an associated long-term commitment of land subject to restricted uses, no substantial residual environmental effects to long-term productivity would be expected to result from any of the proposed mercury management alternatives.

Under the No Action Alternative, environmental resources have already been committed to activities at the current mercury storage locations. The No Action Alternative would maintain existing environmental conditions with negligible or no impacts on the long-term productivity of the environment.

Under the Consolidated Storage Alternatives, the short-term use of resources would result in potential long-term benefits to the environment and enhancement of long-term productivity. Increases in short-term emissions and exposures associated with handling and transportation activities would be followed by long-term decreases in the overall health risks to workers, the public, and the surrounding environment at each former mercury storage location.

Under the Sales Alternatives, increases in short-term emissions and exposures associated with activities to prepare and ship the mercury to domestic or foreign buyers would also be followed by long-term decreases in the overall health risks to workers, the public, and the surrounding environment at each former mercury storage location.

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