Assessment of the Potential Costs, Benefits, and Other Impacts of the Proposed Revisions to EPA's Underground Storage Tank Regulations

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Acronyms And Terms

AHFDS – Airport Hydrant Fuel Distribution System

ASTSWMO – Association of State and Territorial Solid Waste Management Officials

ATG – Automatic Tank Gauge / Gauging – an automated process that monitors product level and provides inventory control

BLS – United States Bureau of Labor Statistics

BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes

CFR – Code of Federal Regulations

CITLD – Continuous In-Tank Leak Detection

EGT – Emergency Generator Tank

EPA – United States Environmental Protection Agency

EPAct – Energy Policy Act of 2005

FCT – Field-Constructed Tank

Fill pipe – The access by which the tank is filled

IRS – United States Internal Revenue Service

LLD – Line Leak Detector / Detection – a device that alerts the tank operator to the presence of a leak in underground piping by restricting or shutting off the flow of product through the piping, or by triggering an audible or visible alarm

LUST – Leaking Underground Storage Tank

MIDAS - Modeling of Infection Diseases Agents Study

NACS – National Association of Convenience Stores

NAICS – North American Industry Classification System

NRDA – Natural Resource Damage Assessment

OMB – United States Office of Management and Budget

OUST – Office of Underground Storage Tanks, United States Environmental Protection Agency

PAHs – Polycyclic Aromatic Hydrocarbons

Pd – Probability of detection

Pfa – Probability of false alarm

RFA – Regulatory Flexibility Act

SBA – United States Small Business Administration

SBREFA – Small Business Regulatory Enforcement Fairness Act of 1996

SDWA – Safe Drinking Water Act

SIR – Statistical Inventory Reconciliation – a leak detection method where inventory, delivery, and dispensing data is statistically analyzed

SISNOSE – Significant Impact on a Substantial Number of Small Entities

SPA – State Program Approval

SPCC – Spill Prevention, Control, and Countermeasure

Spill bucket – A contained sump installed at the fill and/or vapor recovery connection points to contain drips and spills that can occur during delivery

Sump – A subsurface area pit designed to provide access to equipment located below ground, and, when contained, to prevent liquids from releasing into the environment

TPH – Total Petroleum Hydrocarbons

Turbine sump – A sump designed to provide access to the turbine area above the tank

TVM – Time value of money

UDC – Under-Dispenser Containment – a device for collecting fluids spilled beneath a dispenser (pump) (e.g. dispenser pan)

UMRA – Unfunded Mandates Reform Act

UST – Underground Storage Tank

VSL – Value of a Statistical Life

WA – Work Assignment

WTP – Willingness to Pay

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Overview

In 1984, Congress responded to the increasing threat to groundwater from leaking underground storage tank (UST) systems by adding Subtitle I to the Solid Waste Disposal Act (SWDA). SWDA required the U.S. Environmental Protection Agency (EPA) to protect the environment and human health from UST releases by developing a comprehensive regulatory program for UST systems storing petroleum or certain hazardous substances. In 1986, Congress amended Subtitle I of SWDA and created the Leaking Underground Storage Tank Trust Fund (LUST Trust Fund) to oversee and pay for cleanups at sites where the owner or operator is unknown, unwilling to pay, or unable to pay.

EPA promulgated the UST regulation in 1988 (40 CFR Part 280). This regulation set minimum standards for new tanks and required owners and operators of existing tanks to upgrade, replace, or close them. The 1988 regulation set deadlines for owners and operators to meet the new requirements. In 1988, EPA also promulgated a regulation for state program approval (40 CFR Part 281). EPA has not significantly changed these regulations since 1988. In 2005, the Energy Policy Act (EPAct) further amended Subtitle I of SWDA. EPAct requires states that receive federal Subtitle I money from EPA to meet certain requirements. EPA developed grant guidelines for states regarding operator training, inspections, delivery prohibition, secondary containment, financial responsibility for manufacturers and installers, public record, and state compliance reports on government UST systems.

After Congress passed EPAct, EPA decided to revise the 1988 UST regulation (at 40 CFR Part 280), primarily to ensure parity in Indian country. Key EPAct provisions (such as secondary containment and operator training) apply to all states receiving federal Subtitle I money, regardless of their state program approval status; but these key provisions do not apply in Indian country (or in states and U.S. territories that do not meet EPA's operator training or secondary containment grant guidelines). In order to establish federal UST requirements similar to the UST secondary containment and operator training requirements of EPAct, EPA decided to revise the 1988 UST regulation. Without these changes, EPAct provisions will not apply in Indian country. These proposed revisions will also fulfill the objectives of the EPA-Tribal UST Strategy (August 2006) in which both EPA and tribes recognized it is important to ensure parity in implementing UST program requirements in states and territories, as well as in Indian country.[1]

EPA decided now is also an appropriate time to change the 1988 UST regulation. While EPA has issued many guidance documents and used various implementation approaches and techniques over the last twenty years, we have not made significant changes to the original 1988 regulation. Indeed, most states have passed requirements that go far beyond the original federal regulation. These regulations fully implement provisions of the EPAct and improve important aspects of the existing (outdated) regulations. Furthermore, while information on sources and causes of releases show that releases from tanks are less common than they once were, releases

[1] See http://www.epa.gov./oust/fedlaws/Tribal%20Strategy_08076r.pdf

from piping and spills and overfills associated with deliveries have emerged as more common problems.[2] Releases at the dispenser have also emerged as one of the leading sources of releases. The lack of proper operation and maintenance of UST systems is a main cause of release from these areas. The proposed revisions focus on ensuring equipment is properly maintained and working, and highlight the importance of operating and maintaining UST equipment so releases are prevented and detected early in order to avoid or minimize potential soil and groundwater contamination.

EPA worked diligently to ensure our proposed regulation development process was open and transparent. Over a two year period, we provided all stakeholders – state and tribal regulators; federal facilities; petroleum industry members, including representatives of owners and operators; equipment manufacturers; small businesses; local governments; and environmental and community groups – an opportunity to share their ideas and concerns through a variety of meetings, conference calls, and email exchanges. EPA thoroughly considered all input as we developed the proposed UST regulation changes.

Proposed Regulatory Changes

EPA is proposing to revise the 1988 UST regulation in order to: establish federal requirements similar to certain key provisions of the EPAct; ensure owners and operators perform proper operation and maintenance; address deferrals; update the regulation to current technology and practices; and make technical and editorial corrections. Specifically, EPA is proposing these revisions (hereafter the Preferred Option):

- Establish federal requirements for secondary containment and operator training similar to those established by the EPAct for states that receive federal Subtitle I money

- Add operation and maintenance requirements
  - Walkthrough inspections
  - Spill prevention equipment tests
  - Overfill prevention equipment tests
  - Interstitial integrity tests
  - Operability tests for release detection methods

- Address existing 40 CFR 280 deferrals
  - Require release detection for emergency generator UST systems
  - Remove deferrals and regulate airport hydrant fuel distribution systems (AHFDSs) and UST systems with field-constructed tanks (FCTs) with alternate release detection requirements
  - Remove deferrals for wastewater treatment tanks

[2] U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "Evaluation of Releases from New and Upgraded Underground Storage Tank Systems – Peer Review Draft," U.S. EPA, August 2004, and U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "Petroleum Releases at Underground Storage Tank Facilities in Florida," draft, March 2005.

- Provide for other changes to improve release prevention and detection and program implementation
    - o Require testing after repairs to spill and overfill prevention equipment, and interstices
    - o Eliminate flow restrictors in vent lines as an overfill prevention option for all new tanks and when overfill devices are replaced
    - o Require closure of lined tanks that cannot be repaired according to a code of practice
    - o Address responses to interstitial monitoring alarms
    - o Notification requirement of ownership change
    - o Eliminate groundwater and vapor monitoring as release detection methods
    - o Establish requirements for determining compatibility

- Make general updates to the regulation
    - o Reference newer technologies, including explicitly adding statistical inventory reconciliation (SIR) and continuous in-tank leak detection (CITLD) as release detection methods
    - o Update codes of practice listed in the regulation
    - o Remove old upgrade and implementation deadlines
    - o Make editorial and technical corrections

- Revise state program approval (40 CFR Part 281) to be consistent with the above revisions

In addition to the Preferred Option, EPA considered two other regulatory alternatives, described as Alternative 1 and Alternative 2. Alternative 1 is overall more stringent than the Preferred Option. Alternative 2 is overall less stringent than the Preferred Option. Exhibit ES-1 summarizes the requirements under each alternative.

EPA designed this assessment to satisfy the Office of Management and Budget's (OMB) requirements for regulatory review under Executive Order 12866 (as amended by Executive Order 13258), which applies to any significant regulatory action. This document also fulfills these requirements:

- Regulatory Flexibility Act, as amended by Small Business Regulatory Enforcement Fairness Act of 1996
- Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*
- Executive Order 13045, *Protection of Children From Environmental Health Risks and Safety Risks*
- Unfunded Mandates Reform Act of 1995
- Executive Order 13175, *Consultation and Coordination With Indian Tribal Governments*
- Executive Order 13132, *Federalism*

- Executive Order 13211, *Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use*

Exhibit ES-1

Options Considered For The Proposed Rule

Requirement Description	Options		
	Preferred	Alternative 1	Alternative 2
Release Prevention			
Walkthrough inspections	Monthly	Monthly	Quarterly
Overfill prevention equipment tests	3 year	1 year	3 year
Spill prevention equipment tests	1 year	Require replacement every 3 years, no testing	1 year
Interstitial integrity tests	3 year	1 year	Not required
Testing after repairs to spill and overfill prevention equipment, and interstices	Required	Required	Required
Elimination of flow restrictors in vent lines for all new tanks and when overfill devices are replaced	Required	Required	Not required
Release Detection			
Operability tests for release detection methods	1 year	1 year	3 year
Change leak rate probabilities from 95/5 to 99/1 (Pd/Pfa)	Not required	Required	Not required
Add SIR and CITLD to regulation with performance criteria	Required	Required	Required
Response to interstitial monitoring alarms	Required	Required	Required
Eliminate groundwater and vapor monitoring as release detection methods	Eliminate in 5 years	Eliminate immediately	Not required
Remove deferral for emergency generator tanks	Required	Required	Required
Other			
Require notification of ownership change	Required	Required	Required
Closure of lined tanks that cannot be repaired according to a code of practice	Required	Required	Required
Requirements for determining compatibility	Required	Required	Required
Remove deferrals for airport hydrant fuel distribution systems and UST systems with field-constructed tanks	Regulate under alternative release detection requirements	Regulate under release detection requirements for conventional UST systems	Maintain deferrals
EPAct-related Provisions			
Operator training	Required	Required	Required
Secondary containment	Required	Required	Required

Summary of Findings

Within the constraints of data availability, EPA in this analysis identified all quantifiable and qualitative impacts for this proposed rule. EPA obtained sufficient data to identify, by state, the number of units likely to be affected by each proposed change in the proposed rule. In our analysis, we used these data to assess the compliance costs imposed upon units and relevant state governments. In conducting these analyses, EPA also assessed the sensitivity of outcomes to key assumptions. Separately, the analysis monetizes a number of impacts of the proposed rule including: avoided costs generated by avoided releases; reduction in severity of releases; avoided product loss; avoided vapor intrusion damages; and a subset of human health benefits.

This analysis quantifies, but does not value, groundwater impacts. Finally, due to data and resource limitations, EPA in this analysis was unable to quantify or value a subset of human health benefits and ecological impacts, but addressed these qualitatively.

In addition to identifying costs and positive impacts, EPA in this analysis also examined the economic and distributional impacts of the proposed rule. The economic impact analysis includes the proposed rule's effect on facility closures, employment, and energy output and cost. In the analysis of the proposed rule's distributional impacts, we examined small business impacts, effects on minority and low-income populations, impacts on children's health, and potential impacts on state financial assurance funds. Finally, EPA's analysis considered the proposed rule's impacts related to certain executive orders and statutes, including Unfunded Mandates Reform Act, tribal governments, and federalism.

The main conclusions of this analysis are:

- Compliance costs[3] – EPA estimated $210 million in annual compliance costs for the proposed rule. Costs range from approximately $130 million under Alternative 2 to $520 million under Alternative 1.

- State and local government costs – Annual state and local government costs, including compliance costs to UST systems owned or operated by state and local governments, state program approval costs, and state costs for processing ownership changes, and one-time notifications for previously deferred systems are approximately $9 million. These range from approximately $7 million under Alternative 2 to $19 million under Alternative 1.[4]

- Avoided costs – Avoided remediation costs form the majority of positive impacts from the proposed rule. EPA estimated the proposed rule will avoid total costs of $300 million per year to $740 million per year under the Preferred Option. This includes: $300 million to $700 million in avoided remediation costs from avoided releases and avoided groundwater contamination incidents; $0.4 million to $26 million in avoided vapor intrusion remediation costs; and approximately $2 million to $7 million in avoided product loss. Total avoided costs range from $310 million to $770 million under Alternative 1 and from $110 million to $590 million under Alternative 2.

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[3] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

[4] If all applicable state and local government costs were incurred in the first year, rather than annualized and discounted, state and local governments would incur approximately $7 million in costs under the Preferred Option. This includes $0.9 million for states to apply for state program approval and to read the regulations, $0.6 million for states to process one-time notifications of EGTs, AHFDSs, and FCTs, and ownership changes that occur in the first year, and $5.6 million for state and local government owners and operators of UST systems to comply with requirements that come into effect in the first year (approximately 47% of which would be for state and local government owners and operators to read the proposed regulation).

- Benefits – Due to data and resource constraints, EPA only quantified human health benefits from avoided benzene-related cancer and was unable to quantify or monetize many of the proposed rule's benefits. The benefits from avoided benzene-related cancer total less than $5,000 per year. In addition, EPA estimated the proposed rule could potentially protect 110 billion to 350 billion gallons of groundwater each year.[5] Categories of nonmonetizable or nonquantifiable benefits that are qualitatively discussed in this analysis include: avoidance of nonbenzene health risks, mitigation of acute exposure events and large-scale releases (e.g., releases from airport hydrant fuel distribution systems and UST systems with field-constructed tanks[6]), and protection of ecological biota.

- Compliance costs and avoided costs under the alternative baseline – Under the alternative baseline scenario that assumes declines in the universes of both UST systems and releases over time, EPA estimated $200 million in annual compliance costs for the proposed rule. Annual compliance costs in the alternative baseline scenario range from $120 million under Alternative 2 to $510 million under Alternative 1. EPA also estimated total avoided costs of $180 million to $440 million under the Preferred Option in the alternative baseline scenario. These avoided costs range from $64 million to $360 million under Alternative 2 to $180 million to $460 million under Alternative 1.

- Average economic impacts – Motor fuel retailers, which account for roughly 80 percent of UST systems, are expected to bear approximately 70 percent of the total costs under the Preferred Option. To establish how the proposed rule may impact the market, EPA examined whether it imposes a cost greater than the average after-tax profit margin of 1.5 percent for motor fuel retailers.[7] Using this benchmark, we estimate approximately 560 firms may exit the market if they cannot pass costs through to customers. This number represents less than one percent of the total universe of facilities.[8]

- State financial assurance funds – Decreases in release frequency and severity may decrease payments required of state financial assurance funds by $150 million per year or more under the Preferred Option. To the extent that these funds are

[5] See chapter 4.10 for details on how this estimate was derived.

[6] For example, an estimated 300,000 to 500,000 gallons of fuel was released from a 2.1 million gallon underground field-constructed tank at a fuel depot in Portsmouth, VA. Free product was found within 20 feet of a nearby creek in 1987. The release was attributed to tank and/or piping failures. Another example is Pease Air Force Base, where jet fuel was delivered to the runway apron via an underground fueling system. Historical leakage from the system contaminated soil and groundwater, forming groundwater plumes at many sites along the system. A site release study identified 60 to 70 release points with varying degrees of severity along the refueling system line with free product found under the apron at closure.

[7] When costs exceed facility profits, it is likely that in the long-term, the facility would exit the market.

[8] In comparison, between 2005 and 2008, the number of gas station facilities decreased an average of 1.4 percent per year (or 2,400 stations per year).

maintained by taxes other than those assessed on UST operators, decreases in these payments effectively represent a reallocation of costs from public entities to the private entities responsible for releases.

Assessment of Compliance Costs

For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs for the following reasons:

- The regulatory requirements generally focus on additional testing and inspection of existing equipment and do not reflect large-scale investments in equipment or significant changes to operations at the facility level. In addition, the facilities affected by the proposed rule are distributed with relative geographic uniformity for consumers and producers.

- Given the relatively small facility costs of less than $900 per year for the average facility, closures or changes in market structure represent an unlikely response to the proposed rule. According to the 2002 Economic Census, average revenues in the retail motor fuel sales sector were approximately $2.1 million; the corresponding cost-to-sales ratio for the average facility is less than one-tenth of one percent. Therefore, it is unlikely significant changes to production or consumer behavior will affect social costs.

- The short- and long-run impacts of the proposed rule are not likely to differ significantly. Testing and inspection requirements may offer some opportunities for owners and operators to reduce costs by learning over time, but they are not likely to reduce costs enough to facilitate large-scale equipment upgrades.

EPA's calculation of total incremental compliance costs for UST facilities reflects two key components: identifying specific measures necessary for compliance at individual facilities and calculating costs associated with each of these measures. To estimate these costs, EPA developed a compliance cost model that identifies incremental equipment and labor requirements for an individual system. Based on the baseline equipment use profile, existing state regulations, and anticipated responses to the proposed regulation, the model then generates system-specific estimates of compliance costs. Compliance costs include labor and capital costs associated with new equipment and installation, inspection, testing, and recordkeeping. The model also includes other compliance costs, such as those associated with more frequent detection of equipment failure and repair of equipment. Some component costs are specific to individual UST system configurations – for example, airport hydrant fuel distribution systems or UST systems with field-constructed tanks – while others are consistent across all system types. Exhibit ES-2 summarizes the findings of our analysis of compliance costs.

Exhibit ES-2 **Total Annual Compliance Costs**[d,e]			
Category	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
Conventional UST systems[a]	$180	$360	$120
Emergency generator tanks (EGTs)	$2.2	$2.2	$2.1
Airport hydrant fuel distribution systems (AHFDSs)	$18	$120	$0.0
UST systems with field-constructed tanks (FCTs)	$4.6	$33	$0.0
Cost to owners and operators to read regulations	$5.1	$5.1	$5.1
State government administrative costs[b]	$0.2	$0.2	$0.2
Total Annual Compliance Costs[c,e]	**$210**	**$520**	**$130**

[a] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[b] The costs for UST systems directly owned or operated by local, state, and federal government entities are included in the estimates of compliance costs within the other categories (see Exhibit ES-6). Costs shown here reflect the administrative costs for state governments to read the regulations, apply for state program approval, process notifications of ownership changes, and process one-time notifications of EGT, AHFDS, and FCT existence.
[c] Totals may not add up due to rounding.
[d] Cost estimates were derived using a seven percent discount rate.
[e] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

Assessment of Benefits and Cost Savings

Avoided remediation costs provide the basis for a substantial portion of the beneficial impacts associated with the proposed rule. Avoided remediation costs of the proposed rule represent cost savings that accrue to owners, operators, and public entities charged with remediating releases at regulated facilities. EPA obtained remediation costs from a survey of state leaking UST programs and estimates of the distribution of releases by UST system area from internal research.[9] EPA identified five UST technical experts who provided professional judgment regarding the proposed rule's effects on reduction in release frequency (number of releases per year) and release severity (as measured by groundwater incidents averted). This body of knowledge allowed EPA to estimate total avoided costs, as well as avoided costs per requirement. EPA also estimated avoided costs associated with vapor intrusion and product loss, though these avoided costs are not allocated across requirements.[10]

In addition to avoided costs, the analysis monetized avoided benzene cancer risks from avoided contaminated groundwater and quantified volume of groundwater protected. These benefits assume that exposure risk is eliminated at the time of discovery and cleanup, and are

[9] Office of Underground Storage Tanks, *Evaluation of Releases from New and Upgraded Underground Storage Tank Systems – Peer Review Draft*, U.S. EPA, August 2004.

[10] These costs were not allocated because we did not ask the experts to estimate quantitatively how different regulatory requirements would specifically affect vapor intrusion or product loss. Vapor intrusion frequency and cost data rely on general information we received from several states, and are typically recorded as additional remedial activities at some groundwater sites. The likelihood of vapor intrusion, however, is driven by proximity of receptors and by geology, and is not predictably related to the size or age of a plume. Product loss estimates rely on data from Florida and other sources for typical release sizes and are mapped to the estimates of avoided releases.

therefore additive to avoided cleanup costs. Finally, the analysis provided a qualitative discussion of avoided acute events and exposure (including large-scale releases, such as those from airport hydrant fuel distribution systems and UST systems with field-constructed tanks), ecological benefits, and avoided nonbenzene human health risks. These findings are summarized in Exhibit ES-3 below.

Exhibit ES-3

Summary Of Annual Positive Impacts[e]

Type Of Impact	Preferred Option (2008$ millions)	Alternative 1 (2008$ millions)	Alternative 2 (2008$ millions)
Monetized Benefits			
Avoided cancer risks[a,c]	$0.001 - $0.005	$0.002 - $0.005	$0.001 - $0.003
Monetized Avoided Costs			
Releases and groundwater incidents[b]	$300 - $700	$300 - $740	$110 - $570
Vapor intrusion	$0.4 - $26	$0.5 - $28	$0.2 - $19
Product loss	$2.0 - $7.2	$2.6 - $7.6	$0.4 - $5.3
Total[c]	**$300 - $740**	**$310 - $770**	**$110 - $590**
Nonmonetized Impact [d]			
Groundwater protected (billion gallons)	110 - 350	120 - 370	41 – 250
Acute events and large-scale releases (e.g., AHFDS and FCT releases)	Not estimated	Not estimated	Not estimated
Ecological benefits	Not estimated	Not estimated	Not estimated
Nonbenzene human health risks	Not estimated	Not estimated	Not estimated

[a] The pathway assessed to evaluate avoided cancer risk is benzene exposure through contaminated groundwater.
[b] Monetized avoided costs are substantially lower in Alternative 2 relative to the Preferred Option due to differing requirements between these options, particularly walkthrough inspections. Alternative 2, overall, is less stringent than the Preferred Option, and therefore prevents fewer releases because systems do not require the same frequency of inspection and repair. For additional information, see Chapter 4.
[c] Avoided cancer risks and avoided costs are separate and additive (i.e., these estimates do not overlap). Avoided cancer risks are the benefits associated with reducing cancer cases prior to discovery of the release. Avoided remediation costs from releases and groundwater incidents are the costs related to site remediation. Avoided vapor intrusion costs include additional avoided costs associated with the remediation of vapor intrusion cases; the RIA does not address human health risk associated with vapor intrusion. Avoided product loss costs are also separate and additive.
[d] Due to data and resource constraints, EPA was unable to monetize some of the positive impacts of the proposed rule. Chapter 4 provides a qualitative discussion of these benefits.
[e] Totals may not add up due to rounding. Cost estimates were derived using a seven percent discount rate.

Comparison of Compliance Costs and Positive Impacts

Exhibit ES-4 summarizes the compliance costs and positive impacts of the proposed rule. The majority of measurable positive effects occur as avoided remediation costs. Monetized social benefits occur only in the form of avoided cancer cases from groundwater contamination and constitute only a very small part of overall effects. Nevertheless, as discussed in Chapter 4, avoided costs provide a reasonable measure of the positive effects of the proposed rule.

Exhibit ES-4

Comparison Of Annual

Compliance Costs, Cost Savings And Monetized Benefits[g,h]

	Preferred Option (2008$ millions)	**Alternative 1 (2008$ millions)**	**Alternative 2 (2008$ millions)**
Annual Monetized Benefits			
Avoided cancer risks[a,e]	$0.001 - $0.005	$0.002 - $0.005	$0.001 - $0.003
Annual Avoided Costs[e]			
Releases and groundwater incidents	$300 - $700	$300 - $740	$110 - $570
Vapor intrusion	$0.4 - $26	$0.5 - $28	$0.2 - $19
Product loss	$2.0 - $7.2	$2.6 - $7.6	$0.4 - $5.3
Annual Compliance Costs			
Conventional UST systems[b]	$180	$360	$120
Emergency generator tanks (EGTs)	$2	$2	$2
Airport hydrant fuels distribution systems (AHFDSs)[c]	$18	$120	N/A
UST systems with field-constructed tanks (FCTs)[c]	$5	$33	N/A
Cost to owners and operators to read regulations	$5	$5	$5
State government administrative costs[d]	$0.2	$0.2	$0.2
Total Annual Benefits and Avoided Costs	**$300 - $740**	**$310 - $770**	**$110 - $590**
Total Annual Compliance Costs[h]	**$210**	**$520**	**$130**
Net Cost (Savings) To Society [Total Compliance Costs *less* Total Benefits and Avoided Costs]	**($530) - ($90)**	**($250) - $210**	**($460) - $20**
Nonmonetized Benefits[f]			
Groundwater protected (billion gallons)	110 - 350	120 - 370	41 - 250
Acute events and large-scale releases (e.g., AHFDS and FCT releases)	Not estimated	Not estimated	Not estimated
Ecological benefits	Not estimated	Not estimated	Not estimated
Nonbenzene human health risks	Not estimated	Not estimated	Not estimated

[a] The pathway for avoided cancer risk is contaminated groundwater.
[b] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[c] We estimate there are 239 UST systems with FCTs and 162 AHFDSs that could be affected by the proposed regulation. For additional information regarding the assumptions and costs used in this analysis for these systems, see Appendix A.
[d] The costs for UST systems directly owned or operated by local, state, and federal government entities are included in the estimates of compliance costs within the other categories. Costs shown here reflect the administrative costs for state governments to read the regulation, apply for state program approval, process notifications of ownership changes, and process one-time notifications of EGT, AHFDS, and FCT existence.
[e] Avoided cancer risks and avoided costs are separate and additive (i.e., these estimates do not overlap). Avoided cancer risks are the benefits associated with reducing cancer cases prior to discovery of the release. Avoided remediation costs from releases and groundwater incidents are the costs related to site remediation. Avoided vapor intrusion costs include additional avoided costs associated with the remediation of vapor intrusion cases; the RIA does not address human health risk associated with vapor intrusion. Avoided product loss costs are also separate and additive.
[f] Due to data and resource constraints, EPA was unable to monetize some of the positive impacts of the proposed rule. Chapter 4 provides a qualitative discussion of these benefits.
[g] Totals may not add up due to rounding. Cost estimates were derived using a seven percent discount rate.
[h] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

Exhibit ES-5 summarizes the compliance costs and positive impacts of the proposed rule under an alternative baseline where universes of UST systems and releases are assumed to decrease at a declining rate over time. Compliance costs decline slightly under the alternative baseline relative to the primary analysis due to a small decrease in affected systems. Avoided costs decline by approximately 40 percent, as the universe of releases contracts substantially under the alternative baseline.

Exhibit ES-5

Comparison Of Annual

Compliance Costs, Cost Savings And Monetized Benefits Using An Alternative Baseline

	Preferred Option (2008$ millions)	Alternative 1 (2008$ millions)	Alternative 2 (2008$ millions)
Total Annual Benefits and Avoided Costs	**$180 - $440**	**$180 - $460**	**$64 - $360**
Total Annual Compliance Costs	**$200**	**$510**	**$120**
Net Cost (Savings) to Society [Total Compliance Costs *less* Total Benefits and Avoided Costs]	**($240) - $20**	**$50 - $330**	**($240) - $56**

Note: Cost estimates were derived using a seven percent discount rate.

Economic Impacts

EPA's assessment of the economic impacts associated with this proposed rule focused on the retail motor fuels sector, which accounts for approximately 80 percent of UST owners or operators. In this analysis, EPA described supply and demand dynamics within the retail motor fuels market and the likely economic responses to increased compliance costs. Our screening assessment found that average estimated facility-level costs of $890 may result in the market exit of approximately 560 facilities, if these facilities cannot pass any regulatory costs through to customers. This represents less than half of one percent of existing retail motor fuel facilities, and an even smaller fraction of all facilities affected by the proposed rule.

To address uncertainty related to the distribution of costs among UST facilities, we also presented a worst case sensitivity analysis, which identified the maximum number of facilities that could face significant economic impacts due to regulatory costs. We defined the worst case as the scenario where the highest possible cost occurred for the smallest facilities. We found that up to 6,100 facilities (roughly four percent of existing retail motor fuel facilities) may exit the market in this unlikely worst-case scenario. The limited magnitude of impacts even in the worst case scenario suggest that the proposed rule will not affect existing consolidation trends in the retail motor fuels industry, or retail motor fuel prices or consumption.

In addition, EPA's analysis suggests that the proposed rule could result in a reallocation of costs from the public to private parties responsible for releases.[11] The prevention of releases under this rule would increase compliance costs to facility owners, but the avoided releases

[11] For additional information regarding this issue, see Chapter 5.

would in many cases reduce remediation demand for taxpayer-funded state funds. This is likely to improve behavioral incentives, as the parties most likely to cause releases will also be responsible for preventing them. As discussed in Chapter 5, this reallocation could result in savings to state financial assurance funds in excess of $150 million per year.

Other Regulatory and Distributional Issues

As part of our analysis, we also assessed the proposed rule's potential impacts related to:

- Energy impacts – The proposed rule will not have significant adverse effects on energy supply, distribution, or use, including impacts on price and foreign supplies. It is, therefore, not a significant energy action under Executive Order 13211, *Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use* (May 18, 2001).

- Regulatory flexibility – EPA's analysis determined that approximately 1,350 small entities (roughly one percent of the universe of affected small entities) may experience economic impacts that exceed one percent of revenues. For various reasons, and especially due to different system configurations for smaller facilities, the actual number of affected entities is likely to be even fewer than the number estimated by the analysis. In comparison, this number is smaller than the recent industry consolidation rate of approximately 2,400 facilities per year in the retail motor fuels sector. The proposed rule is unlikely to have a significant economic impact on a substantial number of small businesses or small governments.

- Small government impacts – The proposed rule is not expected to have significant small government impacts. EPA's assessment of costs to state and local governments indicated that no government-owned UST facilities will experience costs that exceed one percent of revenues.

- Impacts on minority and low-income populations – Because the proposed rule would increase regulatory stringency and reduce the number and size of releases, the proposed rule is not expected to have any disproportionately high and adverse human health or environmental effects on minority or low income populations, or on any community.

- Children's health protection –While the risk assessment did not specifically measure exposure to children, adults are the more sensitive receptor for cancer effects of contaminated groundwater due to the longer potential exposure from showering (inhalation of vapors) compared to children (ingestion of water while bathing), particularly those under five who are assumed to take more baths and fewer showers. Therefore, EPA has no reason to believe that the proposed rule would have a disproportionate environmental health risk effect on children, as defined in Executive Order 13045, *Protection of Children From Environmental Health Risks and Safety Risks* (62 FR 19885, April 23, 1997). Moreover, because the proposed rule is expected to reduce exposure to contaminated groundwater by reducing the number and size of releases, EPA does not expect the proposed rule to have any adverse impact on children.

- Regulatory planning and review – Pursuant to the terms of Executive Order 12866 [58 FR 51735 (October 4, 1993)], EPA determined the proposed rule is an economically significant regulatory action because it may have an annual effect on the economy of $100 million or more, as defined in section 3(f)(1) of the order. Findings of the regulatory cost analysis in Chapter 3 indicate the rule, as proposed, is projected to result in aggregate annual compliance costs of approximately $210 million under the Preferred Option, $520 million under Alternative 1, and $130 million under Alternative 2.

- Unfunded mandates analysis – The proposed rule is subject to the requirements of sections 202 and 205 of the Unfunded Mandates Reform Act (UMRA) because it contains federal mandates that may result in the expenditure by state, local, and tribal governments or by the private sector of $100 million or more in any one year. Exhibit ES-6 provides references for EPA's analyses responding to UMRA requirements under which this proposed rule is subject.

Exhibit ES-6

Location Of Analyses Responding To UMRA Requirements

Requirement	**Location In This Document**
Identification of federal law provision under which the proposed rule is being promulgated	Chapter 1
Assessment of costs and benefits to state, local, and tribal governments and the private sector of the proposed rule	Chapters 3 and 4
Assessment of the effect of the proposed rule on health, safety, and the natural environment	Chapter 4
Assessment of the extent to which such costs of the proposed rule may be paid with federal financial assistance	Chapter 3; no federal assistance is anticipated
Assessment of the extent to which there are available federal resources to carry out this mandate	Chapter 3; no federal resources are anticipated
Estimates of future compliance costs of the proposed rule	Chapter 3
Estimates of disproportionate budgetary effects of the proposed rule on any type of government or private sector segment	Chapter 5
Estimates of the effect of the proposed rule on the national economy	Chapters 3 and 5

- Federalism – Executive Order 13132, *Federalism* (64 FR 43255, August 10, 1999), defines policies that have federalism implications to include regulations with substantial direct effects on states, on the relationship between the national government and states, or on the distribution of power and responsibilities among the various levels of government. EPA typically considers a policy to have federalism implications if it results in aggregate expenditures by state and/or local governments of $25 million or more in any one year. As Exhibit ES-7 below indicates, EPA does not expect any of the proposed options to have significant federalism implications.

Exhibit ES-7

Summary Of Annual Governmental Costs By Element[b]

Element	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Local compliance costs[a]	$7.3	$15.0	$5.0
State compliance costs[a]	$1.8	$3.7	$1.3
State government administrative costs	$0.2	$0.2	$0.2
Total Costs To State And Local Governments	**$9.3**	**$19.0**	**$6.5**

[a] State and local government compliance costs are included in the total compliance costs presented in Exhibit ES-2.
[b] Cost estimates were derived using a seven percent discount rate.

- Tribal governments analysis – Executive Order 13175, *Consultation and Coordination With Indian Governments* (65 FR 67249, November 9, 2000), requires EPA to develop a process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications. EPA consulted with tribal officials early in the process of developing this proposed regulation to welcome meaningful and timely input into its development. EPA began its consultation with tribes on possible changes to the UST regulation shortly after the passage of the Energy Policy Act of 2005. In addition to our early consultation with tribes, EPA also reached out again to tribes as we started the official rulemaking process and throughout the development of this proposed rule. EPA sent letters to leaders of over 500 tribes as well as to tribal regulatory staff to invite their participation in the development of the regulation. EPA heard from both tribal officials who work as regulators as well as representatives of owners and operators of UST systems in Indian country. The tribal regulators raised concerns about ensuring parity of environmental protection between states and Indian country. Today's proposed changes to the UST regulation are needed to ensure parity between UST systems in states and in Indian country. This regulation will ensure installed equipment is working properly to protect the environment from potential releases.

  As part of this analysis, EPA concluded the proposed rule will have tribal implications to the extent that tribally-owned entities with UST systems on Indian country would be affected. However, it will neither impose substantial direct compliance costs on tribal governments, nor preempt tribal law. Total costs to owners and operators of tribally-owned UST systems are approximately $0.7 million.

- Joint impacts of rules – Facilities in the UST system universe are affected by a number of existing regulations, including state regulations and Spill Prevention, Control, and Countermeasure (SPCC) rules. At the time of the 1988 UST regulation, completely buried tanks greater than 42,000 gallons and located near navigable waters of the U.S. or adjoining shorelines were subject to both UST rules and SPCC rules. Since then, SPCC rules have been amended and the rule exempts completely buried storage tanks, as well as connected underground piping, underground ancillary equipment, and containment systems, when subject to the technical requirements of 40 CFR part 280. In today's proposal, EPA proposes to continue to defer the aboveground components associated with airport hydrant systems and USTs with field-constructed tanks. These aboveground components will be subject to SPCC requirements. EPA is proposing to regulate the underground components associated with airport hydrant systems and USTs with field-constructed tanks. Once the proposal becomes final, these underground components will no longer be subject to SPCC requirements. In addition, previously deferred wastewater treatment tank systems and UST systems that store fuel solely for use by emergency power generators will now be regulated under the UST regulation and will no longer be subject to SPCC. EPA does not believe the proposed rule creates a serious inconsistency or interferes with any other actions planned or undertaken by other agencies.

Chapter 1. Introduction

This document presents an analysis by the U.S. Environmental Protection Agency (EPA) Office of Underground Storage Tanks (OUST) of the costs, benefits, and economic impacts of the proposed targeted changes to the Underground Storage Tank (UST) regulations. The proposed rule serves the purpose of strengthening the existing underground storage tank regulations by increasing the emphasis on proper operation and maintenance of UST systems and improved maintenance of release detection equipment. The proposed changes also acknowledge improvements in technology over the last twenty years, including the ability to perform release detection for many tank systems that were previously deferred.

1.1 Background

In 1984, Congress responded to the increasing threat to groundwater from leaking underground storage tank (UST) systems by adding Subtitle I to the Solid Waste Disposal Act (SWDA). SWDA required EPA to protect the environment and human health from UST releases by developing a comprehensive regulatory program for UST systems storing petroleum or certain hazardous substances. In 1986, Congress amended Subtitle I of SWDA and created the Leaking Underground Storage Tank Trust Fund (LUST Trust Fund) to oversee and pay for cleanups at sites where the owner or operator is unknown, unwilling to pay, or unable to pay.

EPA promulgated the UST regulation in 1988 (40 CFR Part 280). This regulation set minimum standards for new tanks and required owners and operators of existing tanks to upgrade, replace, or close them. The 1988 regulation set deadlines for owners and operators to meet the new requirements. By 1998, owners and operators had to meet new UST system requirements, upgrade their existing UST systems, or close them. Owners and operators who chose to upgrade had to ensure that every UST system had spill prevention equipment (e.g., spill buckets), overfill prevention equipment, and was protected from corrosion. In addition, owners and operators were required to monitor their UST systems for releases using release detection (phased in in the 1990s depending on the year of installation of each UST system). Finally, owners and operators were required to have financial responsibility (phased in through 1998) to ensure that they are financially able to pay for any releases that occur. No significant changes have been made to these requirements since 1988.

In 1988, EPA also promulgated a regulation for state program approval (40 CFR Part 281). Since states are the primary implementers of the UST program, EPA wanted to set up a process where state programs could operate in lieu of the federal program if certain requirements were met. This regulation describes the minimum requirements states must meet to have their regulations operate in lieu of the federal regulation.

In 2005, the Energy Policy Act (EPAct) further amended Subtitle I of SWDA. The EPAct requires states that receive federal Subtitle I money from EPA to meet certain requirements. EPA developed grant guidelines for states regarding operator training, inspections, delivery prohibition, secondary containment, financial responsibility for manufacturers and installers, public record and state compliance reports on government UST systems.

1.2 Need for Regulatory Action

After Congress passed EPAct, EPA decided to revise the 1988 UST regulation (at 40 CFR Part 280), primarily to ensure parity in Indian country. Key EPAct provisions (such as secondary containment and operator training) apply to all states receiving federal Subtitle I money, regardless of their state program approval status; but these key provisions do not apply in Indian country (or in states and U.S. territories that do not meet EPA's operator training or secondary containment grant guidelines). In order to establish federal UST requirements similar to the UST secondary containment and operator training requirements of EPAct, EPA decided to revise the 1988 UST regulation. Without these changes, EPAct provisions will not apply in Indian country. These proposed revisions will also fulfill the objectives of the EPA-Tribal UST Strategy (August 2006) in which both EPA and tribes recognized it is important to ensure parity in implementing UST program requirements in states and territories, as well as in Indian country.[1]

EPA decided now is also an appropriate time to change the 1988 UST regulation. While EPA has issued many guidance documents and used various implementation approaches and techniques over the last twenty years, we have not made significant changes to the original 1988 regulation. Indeed, most states have passed requirements that go far beyond the original federal regulation.

Furthermore, while information on sources and causes of releases show that releases from tanks are less common than they once were, releases from piping and spills and overfills associated with deliveries have emerged as more common problems.[2] In addition, releases at the dispenser have emerged as one of the leading sources of releases. The lack of proper operation and maintenance of UST systems is a main cause of release from these areas. Data also indicate that release detection only detects about one quarter of all releases.[3] While some of those releases occur in areas not required to have release detection, other releases that should be detected are not because of problems with the operation and maintenance of the release detection equipment.

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[1] See http://www.epa.gov./oust/fedlaws/Tribal%20Strategy_08076r.pdf

[2] U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "Evaluation of Releases from New and Upgraded Underground Storage Tank Systems – Peer Review Draft," U.S. EPA, August 2004, and U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "Petroleum Releases at Underground Storage Tank Facilities in Florida," draft, March 2005.

[3] About 50 percent of all releases go undetected because they occur in areas where release detection is not required (and therefore is not designed to detect a release). Of the 50 percent that should be detected, 25 percent still go undetected partly because of issues with operation and maintenance of the release detection equipment. (Office of Underground Storage Tanks, U.S. EPA, "Petroleum Releases at Underground Storage Tank Facilities in Florida," U.S. EPA, draft, March 2005, p. 26.)

Since the beginning of the UST program, preventing petroleum releases into the environment has been one of the primary goals of the program. EPA and our partners have made major progress in reducing the number of new releases, but over 7,000 releases are still discovered each year. Because existing publicly-funded mechanisms and institutions frequently cover at least part of the costs of release remediation, owners and operators of UST systems do not bear the full costs of their actions.[4] Petroleum releases thus represent a negative externality caused by UST system operators, as the individuals and firms that cause releases do not bear their full costs. This represents a failure of the market to fully internalize the cost to society of operating an UST system: private costs do not equal social costs. A combination of revised technical standards and inspection and testing requirements represents the most appropriate method for reducing the number of future releases and mitigating the impact of existing negative externalities.

EPA wanted to make sure the rule development process was open and transparent and that all stakeholders had an opportunity to share their ideas as well as their concerns. From the beginning of this process, EPA recognized the concerns about costs on owners and operators and was committed to limiting the requirements for retrofits. We reached out to all stakeholders, including state and tribal regulators, federal facilities, members of the petroleum industry including representatives of owners and operators as well as equipment manufacturers, small businesses, local governments, and environmental and community groups. Over a two-year period, we held conference calls, solicited comments and gave stakeholders multiple opportunities to share their ideas as well as kept them informed of where we were in the process.

From this extensive stakeholder outreach, EPA compiled potential proposed changes to the UST regulations. EPA shared all of these ideas with the stakeholders and gave them an opportunity to comment on each idea that was submitted to us. We then revised and added items to the list as necessary based on data, analysis and consideration of costs and benefits. Ultimately, EPA identified the items in this proposed rule as the needed regulatory changes at this time.

1.3 Summary of the Proposed Rule

EPA is proposing to revise the UST regulations in order to: establish federal requirements that are similar to certain key provisions of the Energy Policy Act; ensure owners and operators perform proper operation and maintenance; address deferrals; update the regulations to current technology and practices; and make technical and editorial corrections. Specifically, EPA is proposing the following set of revisions (hereafter referred to as the Preferred Option):

[4] We refer here to mechanisms other than those whose specific purpose is to fund remediation for new releases from UST systems. For example, if owners and operators in a particular state are compelled to participate in a fund operated by a public (or private) entity, and the contributions made directly by the owners and operators are equal to all the remediation costs, such a policy overcomes the market failure. However, if taxpayers are required to cover any portion of remediation costs through general funds or revenues obtained for other purposes, the negative externality will not be rectified.

- Establish federal requirements for secondary containment and operator training similar to those established by the EPAct for states that receive federal Subtitle I money

- Add operation and maintenance requirements
  - Walkthrough inspections
  - Spill prevention equipment tests
  - Overfill prevention equipment tests
  - Interstitial integrity tests
  - Operability tests for release detection methods

- Address existing 40 CFR 280 deferrals
  - Require release detection for emergency generator UST systems
  - Remove deferrals and regulate airport hydrant fuel distribution systems (AHFDSs) and UST systems with field-constructed tanks (FCTs) with alternate release detection requirements
  - Remove deferrals for wastewater treatment tanks

- Provide for other changes to improve release prevention and detection and program implementation
  - Require testing after repairs to spill and overfill prevention equipment, and interstices
  - Eliminate flow restrictors in vent lines as an overfill prevention option for all new tanks and when overfill devices are replaced
  - Require closure of lined tanks that cannot be repaired according to a code of practice
  - Address responses to interstitial monitoring alarms
  - Notification requirement of ownership change
  - Eliminate groundwater and vapor monitoring as release detection methods
  - Establish requirements for determining compatibility

- Make general updates to the regulation
  - Reference newer technologies, including explicitly adding statistical inventory reconciliation (SIR) and continuous in-tank leak detection (CITLD) as release detection methods
  - Update codes of practice listed in the regulation
  - Remove old upgrade and implementation deadlines
  - Make editorial and technical corrections

- Revise state program approval (40 CFR Part 281) to be consistent with the above revisions

1.4 Alternative Regulatory Options

In addition to assessing the impacts of the Preferred Option, this document assesses the costs, benefits, and economic impacts of two regulatory alternatives, as outlined in **Exhibit 1-1.** Please refer to the preamble for a discussion on the rationale behind the development of these two alternatives.

Under each of these alternatives, EPA evaluated variations of a subset of the proposed changes, while some of the proposed regulatory requirements remained in effect across all options. The differences between the three regulatory options considered in this regulatory impact analysis are described in **Exhibit 1-1**.

Exhibit 1-1

Options Considered For The Proposed Rule

	Options		
Requirement Description	**Preferred**	**Alternative 1**	**Alternative 2**
Release Prevention			
Walkthrough inspections	Monthly	Monthly	Quarterly
Overfill prevention equipment tests	3 year	1 year	3 year
Spill prevention equipment tests	1 year	Require replacement every 3 years, no testing	1 year
Interstitial integrity tests	3 year	1 year	Not required
Testing after repairs to spill and overfill prevention equipment, and interstices	Required	Required	Required
Eliminate flow restrictors in vent lines for all new tanks and when overfill devices are replaced	Required	Required	Not required
Release Detection			
Operability tests for release detection methods	1 year	1 year	3 year
Change leak rate probabilities from 95/5 to 99/1 (Pd/Pfa)	Not required	Required	Not required
Add SIR/CITLD to regulations with performance criteria	Required	Required	Required
Response to interstitial monitoring alarms	Required	Required	Required
Eliminate groundwater and vapor monitoring as release detection methods	Eliminate in 5 years	Eliminate immediately	Not required
Remove deferral for emergency generator tanks	Required	Required	Required
Other			
Require notification of ownership change	Required	Required	Required
Closure of lined tanks that cannot be repaired according to a code of practice	Required	Required	Required
Requirements for determining compatibility	Required	Required	Required
Remove deferrals for airport hydrant fuel distribution systems and UST systems with field-constructed tanks	Regulate under alternative release detection requirements	Regulate under release detection requirements for conventional UST systems	Maintain deferrals
EPAct-related Provisions			
Operator training	Required	Required	Required
Secondary containment	Required	Required	Required

Note that each option considered by EPA contains a set of new requirements that does not vary across options. As explained in the introduction, operator training and secondary containment are being proposed in order to ensure parity in program implementation among states and in Indian country. Therefore, these requirements are necessary across all options. Based on input EPA received from stakeholders, EPA believes the other proposed requirements in this set represent the minimum necessary changes for its proposed rule. Specifically, these requirements are:

- Testing after repairs to spill and overfill prevention equipment, and interstitial spaces
- Adding SIR/CITLD to regulations with performance criteria
- Reporting and testing for interstitial alarms
- Removing the deferral for release detection for emergency generator tanks
- Notification of ownership change
- Closure of lined tanks that cannot be repaired according to a code of practice
- Requirements for determining compatibility, and
- Requiring operator training and secondary containment

Many of the requirements proposed in this rule will not immediately impose new costs upon UST owners or operators. For example, new requirements for periodic testing of equipment do not require owners or operators to perform those tests at the time the rule comes into effect; depending on the requirement, they may have up to three years to satisfy the new requirements.[5] EPA's analysis accounts for this delay in its estimate of costs by discounting the costs associated with each requirement as shown in **Exhibit 1-2**. EPA assumes that the monetized positive impacts associated with these requirements accrue at the end of the year in which costs occur to incorporate an assumption that some beneficial impacts may lag requirements.[6]

[5] Please refer to the preamble section for each proposed requirement for a discussion on the rationale behind the delayed or phase-in implementation periods.

[6] EPA does not have data to suggest any particular length of lag for each requirement; for this analysis, we effectively assume that benefits accrue at the end of the year in which costs occur. Chapters 3 and 4 provide detailed descriptions of the methods used to assess costs and beneficial impacts.

Exhibit 1-2

Years Until Proposed Requirements Become Effective

Requirement	**Number of years until effective**
Release Prevention	
Overfill prevention equipment test[7]	3
Spill prevention equipment test	1
Interstitial integrity test[8]	3
Release Detection	
Operability tests for release detection methods	1
Eliminate groundwater and vapor monitoring as release detection methods (for Preferred Option)	5
Remove deferral for emergency generator tanks	1
Other	
Remove deferral for airport hydrant fuel distribution systems (Subparts B, C, and D)[8]	3
Remove deferral for UST systems with field-constructed tanks (Subparts B, C, and D)[9]	3
EPAct-related Provision	
Operator training	3
Please refer to the preamble section for each proposed requirement for a discussion on the rationale behind the delayed or phase-in implementation periods.	

Finally, EPA is including a set of proposed revisions and clarifications that are not expected to have any economic impact, due either to the nature of the requirement or to the interaction of UST regulations with existing regulations. The only cost associated with these clarifications and changes is the cost of reading the new regulations. These revisions include:

- Removing deferrals for wastewater treatment tanks[9]

[7] As part of this analysis, we assume that overfill prevention equipment tests and interstitial integrity tests will begin after a three-year delay. Phasing in these costs over a three-year period would increase total costs by approximately $5.1 million compared to a three-year delay; this does not affect the total cost estimate presented in the RIA for the proposed rule.

[8] Removing deferrals for airport hydrant fuel distribution systems and field-constructed tanks will require these systems to comply with Subparts B, C, D, E, G, and H of 40 CFR Part 280. The proposed regulation requires these systems to comply with Subparts B, C, and D after 3 years, while compliance with Subparts E, G, and H would be required immediately.

[9] While this represents a new requirement, based on conversations with the Georgia Environmental Protection Division, the National Association of Clean Water Agencies (NACWA), Highland Tank, and the Automobile Recyclers Association, EPA believes that all active wastewater treatment tanks, including tanks at most publicly owned treatment works and many private treatment facilities, are currently regulated by either section 402 or section 307(b) of the Clean Water Act and therefore excluded from 40 CFR 280. As a result, EPA believes that there are no wastewater treatment tank systems currently deferred. Therefore, we assume that the removal of the deferral will have no impact on the regulated universe.

- Updating the regulations to reference newer technologies
- Updating the codes of practice listed in the regulations
- Updating the regulations to remove old upgrade and implementation deadlines
- Updating the regulations for editorial and technical corrections, and
- Revising the State Program Approval (40 CFR Part 281) regulations to be consistent with the above revisions

1.5 Scope of Analysis

Within the constraints of data availability, this analysis attempts to capture all quantifiable and qualitative impacts for this proposed rule. EPA obtained sufficient data to identify, by state, the number of units likely to be affected by each proposed change in the rule. The analysis uses these data to assess the compliance costs on these units and relevant state governments. In conducting these analyses, EPA also assessed the sensitivity of outcomes to key assumptions. Separately, the analysis monetizes a number of impacts of the rule, including the avoided costs generated by avoided releases, reduction in severity of releases, avoided product loss, avoided vapor intrusion damages, and a subset of human health benefits. This analysis quantifies, but does not value, groundwater impacts. Finally, this analysis is unable to quantify or value a subset of human health benefits and ecological impacts, but addresses these qualitatively.

In addition to identifying costs and the positive impacts of the rule, this analysis also examines the economic and distributional impacts of the rule. The economic impact analysis includes the proposed rule's effect on facility closures, employment, and energy output and cost. The analysis of the distributional impacts of the rule examines the effect of a reduction in releases on state financial assurance funds, impacts on childrens' health, small business impacts, and impacts on low-income and minority populations. Finally, this analysis considers impacts of the rule related to certain executive orders and statutes, including the Unfunded Mandates Reform Act, impacts on Tribal Governments, and Federalism impacts.

1.6 Report Organization

To support the development of the proposed rule, EPA designed and conducted this analysis of the rule's costs, benefits, and economic impacts consistent with the requirements of Executive Order 12866, and OMB Circular A-4.[10] Data, methods, and results of this analysis are presented in the following chapters:

[10] Executive Order 12866, Regulatory Planning and Review, October 4, 1993; Office of Management and Budget, Circular A-4, September 17, 2003.

- ***Chapter 2: Universe of UST Systems Affected by the Proposed Rule.*** This chapter identifies a profile of the entities that may be affected by the proposed rule.

- ***Chapter 3: Assessment of Compliance Costs.*** This chapter summarizes the methods employed by EPA to assess the cost impacts of the proposed rule.

- ***Chapter 4: Assessment of Benefits and Cost Savings.*** This chapter presents estimates of the benefits and avoided costs of the proposed rule.

- ***Chapter 5: Distributional Impacts and Considerations.*** This chapter summarizes the assessment of distributional impacts of the proposed rule, including economic and energy impacts, effects on small businesses and governments, impacts on low-income and minority populations, and children's health effects.

- ***Chapter 6: Other Statutory and Executive Order Analyses.*** This chapter summarizes analyses required by certain statutes or executive orders, including regulatory planning and review, impacts created by unfunded mandates, federalism implications, effects on tribal governments, and joint impact of the proposed rule in the context of existing rules.

- ***Chapter 7: Comparison of Costs, Benefits, and Other Impacts.*** This chapter summarizes and compares the costs, cost savings, and benefits of the proposed rule.

- ***Appendices.*** We present the details to methods and assumptions we employ in a number of appendices.

Chapter 2. Universe of UST Systems Affected by the Proposed Rule

This regulatory impact analysis addresses the effects of the proposed regulatory changes on four types of UST systems: conventional UST systems with prefabricated tanks that store and dispense petroleum products; emergency generator tank systems that store fuel for occasional use; UST systems with field-constructed tanks that are typically designed to store large volumes of fuel; and airport hydrant fuel distribution systems that provide large volumes of fuel to aircraft using underground distribution systems.

This chapter describes the universe of systems, facilities, firms, and sectors that are likely to be affected by the proposed regulatory changes, and documents the extent to which state regulations already require compliance with the proposed regulations.

2.1 Types of Entities Affected by the Proposed Rule

The four types of UST systems that are potentially affected by the proposed regulation are characterized as follows:

- **Conventional UST systems (conventional USTs):** These systems include the universe of facilities and tanks that are currently subject to existing regulations, along with ancillary equipment (e.g., piping, dispensers, sumps, spill prevention equipment, and release detection equipment). The majority of these systems store and dispense petroleum products and are typically found at gas stations. A limited number store other hazardous substances, but the regulatory impact analysis does not consider these UST systems separately.[1] These UST systems are subject to all requirements under 40 CFR Part 280.

- **Emergency generator tank systems (EGTs):** Emergency generator tank systems refer to the tanks and piping for systems that provide longer-term storage of fuel for occasional use as a back-up fuel supply. These tanks are currently deferred from 40 CFR Part 280 Subpart D (release detection) but are subject to all other requirements under 40 CFR Part 280. The proposed regulation does not address emergency tanks at nuclear power plants, which are regulated by the Nuclear Regulatory Commission under 10 CFR Part 50, appendix A.[2]

[1] Because tanks storing hazardous substances are also currently subject to the 1988 UST regulations under 40 CFR Part 280 this analysis assumes that incremental costs and benefits associated with the proposed rule will be comparable to the costs and benefits associated with other conventional UST systems. Although hazardous substance tanks are not included in the total number of active petroleum UST systems, EPA roughly estimates that less than one percent of all active regulated UST systems contain hazardous substances.

[2] See 40 CFR 280.10 Subpart A – Applicability.

- **UST systems with field-constructed tanks (FCTs):** Field-constructed tanks are underground bulk storage tanks that are built on-site because they are too large to be pre-fabricated. All identified field-constructed tanks currently in operation are owned by Federal facilities and mainly serve operations at military bases. These tanks are currently deferred from all regulation under 40 CFR Part 280, except for Subparts A and F, but are typically subject to regulation under the Oil Pollution Act of 1990, 40 CFR Part 112 (EPA's Spill Prevention, Control, and Countermeasure regulations).

- **Airport Hydrant Fuel Distribution Systems (AHFDSs):** Airport hydrant fuel distribution systems are systems that include one or more tanks (either above-ground or underground), underground piping, and underground ancillary equipment used to fuel aircraft. These systems do not have a dispenser at the end of the piping run, but instead have a pressurized hydrant (fill stand). Large commercial and military airports employ these systems, but most commercial systems have only above-ground storage tanks and are thus not affected by the proposed regulation.[3] These systems are currently deferred from all regulation under 40 CFR Part 280, except for Subparts A and F, but are typically subject to regulation under 40 CFR Part 112.

2.2 Configuration of Average Conventional UST System

Conventional UST systems reflect a relatively consistent configuration of standard equipment. While facility size and complexity vary significantly, this analysis assumes that a typical (average) conventional UST system is configured as follows (**Exhibit 2-1**):[4]

Exhibit 2-1

Assumed Average Configuration For A Conventional UST System

System Component	Configuration
Pipes per tank	1
Feet per pipe	100
Fill pipes (per tank)	1
Spill prevention equipment (per fill pipe)	1
Under-Dispenser Containment (UDC) (per tank)	2
Turbine sumps (per tank)	1

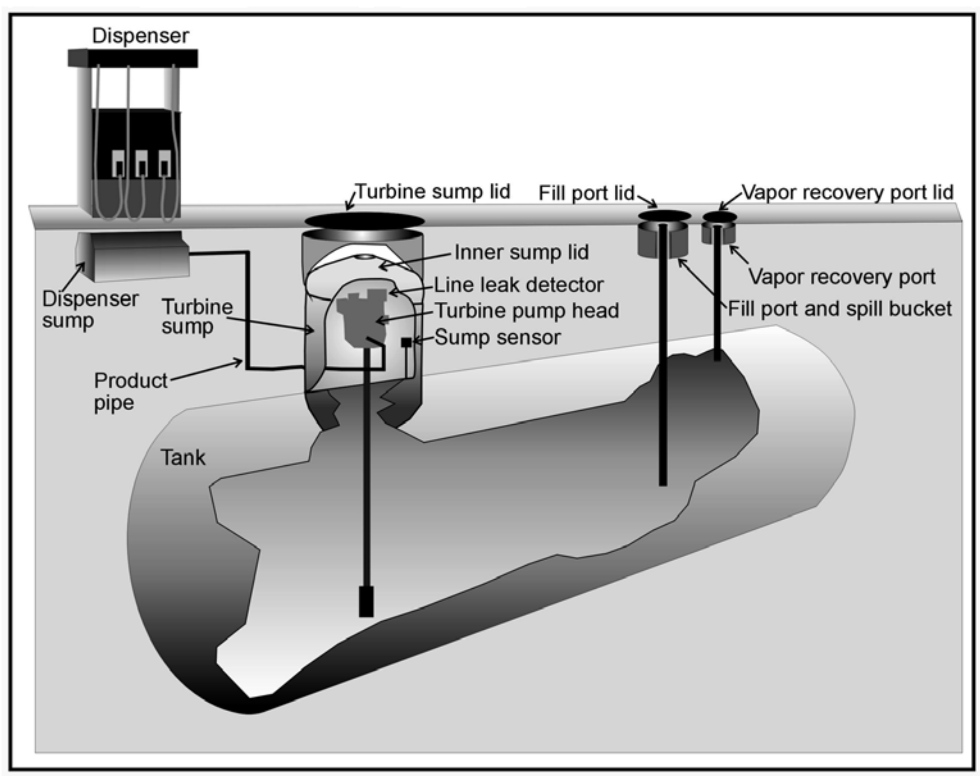
[3] Industrial Economics, Inc., "Preliminary Assessment and Scoping of Data Related to Potential Revisions to the UST Regulations; Tasks 2-4, Work Assignment 1-25," November 20, 2008.

[4] Assumptions based on data collected from pipe installation companies, state data, and EPA professional judgment. See Industrial Economics, Inc., "Methodology for Secondary Containment for Piping," Work Assignment 1-19, Task 5, October 3, 2008 and E^2, Incorporated, memoranda and analyses submitted under Contract EP-W-05-018, "U.S. Environmental Protection Agency. Underground Storage Tanks/Leaking Underground Storage Tanks Analytical and Technical Support." Where gaps existed in the analyses, EPA used the best professional judgment of its UST system technical experts. All supporting materials not included in the appendices can be found in the docket for the proposed rule.

These assumptions best characterize motor fuel retailers, which represent approximately 80 percent of the 611,449 conventional UST systems in operation in 2009.[5] EGT systems and other conventional UST systems used to store fuel or hazardous substances are likely to have systems with similar components and less complex dispenser systems. The configurations of FCTs and AHFDSs are considered separately, and are described in detail in Appendix A. **Exhibit 2-2** provides an illustration of an UST system at a retail motor fuel establishment. Note that in this exhibit, the "dispenser sump" is a specific form of under-dispenser containment, and the "spill bucket" is an example of spill prevention equipment.

Exhibit 2-2

Configuration of Retail Motor Fuel UST System



[5] The remaining 20 percent of conventional UST systems consist of EGTs and tanks used for storing and dispensing fuel in commercial settings, hospitals, manufacturing, transportation, communications and utilities, and agriculture. See Exhibit 2-3 for details.

2.3 UST Universe Size and Distribution Across Sectors

The September 30, 2009 *Semi-Annual Report of UST Performance Measures* reports a universe of 611,449 active petroleum tanks (UST systems) in the United States and its territories.[6,7] This total includes conventional UST systems and emergency generator tank systems. Estimates based on state data suggest that approximately 3.0 percent, or 18,343 of the 611,449 active UST systems, are emergency generator tanks.[8]

In addition to emergency generator and conventional UST systems, the proposed rule addresses UST systems with field-constructed tanks and airport hydrant fuel distribution systems. While these two types of systems are deferred under current EPA regulations, a subset may be regulated by individual states and included in the total estimate of tanks provided by those states. For the purpose of this analysis, however, these two universes are considered to be separate from the 611,449 tanks identified in the 2009 EPA report. The total universe of UST systems with field-constructed tanks and airport hydrant fuel distribution systems is small, including approximately 239 UST systems with field-constructed tanks, and 162 airport hydrant fuel distribution systems (each hydrant system is supported by an average of roughly eight linked tanks).[9]

Most UST systems in the United States are located at motor fuel retail establishments (i.e., gas stations), and virtually all retail motor fuel establishments use UST systems. Approximately 162,000 (161,768) retail fueling sites operated in the United States in 2008.[10] Of these, approximately 115,000 included convenience stores.[11]

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[6] U.S. Environmental Protection Agency, Office of Underground Storage Tanks, *Semi-Annual Report of UST Performance Measures End of Fiscal Year 2009 – As Of September 30, 2009*, http://www.epa.gov/OUST/cat/ca_09_34.pdf. State and territory underground storage tank programs report to EPA periodically throughout the year with data on their UST performance. EPA compiles the data for all states, territories, and Indian country and makes the data publicly available at http://www.epa.gov/OUST/cat/camarchv.htm.

[7] FY2010 data indicate that the universe of tanks has contracted to 597,333 UST systems. To consider the impacts of declining universe sizes on the results of this analysis, we construct and evaluate an alternative baseline for compliance costs and avoided costs in Chapters 3.4.1 and 4.4.1, respectively.

[8] See Industrial Economics, Inc. “Detailed Assessment of UST Universe by Tank Use and Industry Sector,” Work Assignment 1-25, Task 6, January 23, 2009. The number of EGTs is assumed to be approximately 3.0 percent of all active UST systems based on the weighted average from four state databases.

[9] See Industrial Economics, Inc., “Preliminary Assessment and Scoping of Data Related to Potential Revisions to the UST Regulations; Tasks 2-4, Work Assignment 1-25,” November 20, 2008. There are 201 airport hydrant fuel distribution systems owned by the Department of Defense and 40 airport hydrant fuel distribution systems located at commercial airports. Of these, 162 are not fueled by above-ground storage tanks (two commercial airport facilities have UST systems, along with 160 of the 201 Department of Defense systems).

[10] Based on NPN MarketFacts 2008, cited in *National Petroleum News*, “MarketFacts 2008 Overview,” July/August 2008.

[11] National Association of Convenience Stores (NACS), “U.S. Petroleum Industry: Statistics, Definitions,” http://www.nacsonline.com/NACS/Resources/campaigns/GasPrices_2009/Pages/StatisticsDefinitions.aspx.

An analysis of state data by EPA concludes that the average retail motor fuel establishment has 2.97 tanks (UST systems).[12] Assuming approximately 2.97 UST systems per facility and 161,768 facilities, 481,108 UST systems, or 79 percent of all active UST systems, are associated with retail motor fuel establishments.

In addition to traditional motor fuel retailers, big-box retailers, or hypermarkets, represent a growing segment of the retail motor fuel seller market. This category (NAICS code 452910) includes stores operated by Wal-Mart, Costco, and other large companies. Collectively, these firms operate approximately 4,500 filling stations; each station is likely to have at least three UST systems.[13]

Other industry sectors that report use of UST systems include agriculture (crop production and animal production), commercial (wholesale trade, retail trade, accommodation, and food services), communications and utilities (wired telecommunications carriers and electric power generation, transmission, and distribution), hospitals, manufacturing, transportation, local and state government operations, and federal facilities run by the U.S. Departments of Defense and Energy. These sectors comprise approximately 130,000 UST systems, including those in the government sector (**Exhibit 2-3**). In many cases, firms in these sectors use UST systems for fueling fleets of vehicles such as school buses, delivery trucks, or rental cars. In other cases, UST systems store fuel for operations or emergency use, used oil, or hazardous substances.

Facilities in sectors other than retail motor fuel have, on average, between 1.5 and 2.3 UST systems at the facilities that use UST systems. The actual number of UST systems at a specific facility, however, is likely to vary significantly depending on facility size and focus.[14]

Results of an analysis of public UST records of 45 states performed for EPA's Office of Underground Storage Tanks suggest that the average number of UST systems per facility (across all sectors that use conventional UST systems or EGTs), is approximately 2.74.[15]

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[12] A 2006 analysis of 13 state UST databases performed for EPA estimated that the average retail motor fuel establishment (i.e., facility) has 3.13 tanks. Further adjustments to reconcile various estimates of UST use by industry total universe decrease the number of tanks per UST system operating in retail motor fuel settings to 2.97 tanks. See Industrial Economics, Inc., "Small Entities Screening Analysis of UST Universe by Industry Sector," WA 3-25, Task 4, February 4, 2010.

[13] National Association of Convenience Stores (NACS), "U.S. Petroleum Industry: Statistics, Definitions," http://www.nacsonline.com/NACS/Resources/campaigns/GasPrices_2009/Pages/StatisticsDefinitions.aspx.

[14] "Summary of Key Data from State Public Record Postings," E^2, Incorporated, Task Order No. 1010 – Subtask A1-06C Technical Directive No. 36. All supporting materials not included in the appendices can be found in the docket for the proposed rule.

[15] "Summary of Key Data from State Public Record Postings," E^2, Incorporated, Task Order No. 1010 – Subtask A1-06C Technical Directive No. 36, Table 1.

Exhibit 2-3

Summary Of Universe Of UST Systems By Sector

Industry Sector	NAICS	2006 [a]		2009 [b]	
		Number of Facilities with UST Systems	Number of UST Systems	Number of Facilities with UST Systems	Number of UST Systems
Conventional UST Systems and EGTs					
Retail Motor Fuel Sales	447	168,987	526,008	161,768	481,108
Commercial (wholesale trade, retail trade, accommodation, and food services)	42, 44-45, 72 (excluding 447)	22,730	52,271	21,652	49,793
Institutional (hospitals only)	622	2,330	3,812	2,220	3,631
Manufacturing	31-33	9,261	15,259	8,822	14,536
Transportation (air, water, truck, transit, pipeline, and airport operations)	481, 483-486, 48811	8,559	15,140	8,153	14,422
Communications and Utilities (wired telecommunications carriers; and electric power generation, transmission, and distribution)	5171, 2211	6,972	10,223	6,641	9,738
Agriculture (crop and animal production)	111, 112	889	1,610	847	1,534
Local governments [c]	Government jurisdiction	N/E	N/E	N/E	24,458
State governments [c]	Government jurisdiction	N/E	N/E	N/E	6,114
Federal government [c]	Government jurisdiction	N/E	N/E	N/E	6,114
Total: Conventional UST systems and EGTs		**219,728**[d]	**624,323**	**210,103**[d]	**611,449**
UST systems with Field Constructed Tanks and Airport Hydrant Fuel Distribution Systems					
FCTs: Department of Defense	Government jurisdiction			239	239
AHFDSs: Department of Defense	Government jurisdiction			162	1,296[e]
Total: FCTs and AHFDSs				**401**	**1,535**

[a] Sources: December 18, 2006 review of state databases, "Draft Industry and Facility Profiles," E^2, Incorporated, Task Order No. 1010 – General Technical and Programmatic Support in Implementing the Energy Policy Act of 2005, Amendment 1, TDD #11. Estimate of 168,987 retail motor fuel facilities with UST systems from "2005 U.S. motor fuel station count: 168,987," *National Petroleum News*, May 19, 2005 (annual survey of states to collect data on number of stations).

[b] Analysis based on 2006 column (see note a above), adjusted to reflect 2009 universe of 611,449 UST systems. All sector adjustments proportional except retail motor fuel sales, which reflects the 2008 estimate of 161,768 facilities with UST systems from "MarketFacts 2008 Overview," *National Petroleum News*, August 2008, used as a proxy for the number of such facilities in 2009. (See also Industrial Economics, Inc., "Preliminary Assessment and Scoping of Data Related to Potential Revisions to the UST Regulations; Tasks 2-4, Work Assignment 1-25," November 20, 2008.)

[c] See United States Environmental Protection Agency, "Economic Impact Analysis of Additional Mechanisms for Local Government Entities to Demonstrate Financial Responsibility for Underground Storage Tanks," December 1992, Exhibit 3-1. Estimates of local government UST systems adjusted using the 1987 Census of Governments. Consistent with this analysis, the number of government UST systems is assumed to be two percent of all 2009 UST systems owned by state and federal governments and four percent of all 2009 UST systems owned by local governments.

[d] The totals shown are the sum of the number of facilities of the rows above. These estimates are used only to establish distribution of facilities across sectors based on available data.

[e] This number assumes that there are eight tanks per AHFDS. For more detail on assumptions for AHFDSs, see Appendix A.

2.4 Universe of Facilities and Systems Potentially Affected by Proposed Rule

EPA expects that all facilities or UST systems in the universe of conventional UST systems will be required to comply with one or more regulatory changes in the proposed rule, but the number of facilities and systems affected by each specific regulatory change will vary depending on the extent of current (baseline) state regulations and the type of equipment currently in use.

To estimate the number of systems that will be required to comply with each regulatory change, EPA reviewed publicly available data about state regulations, combined with data from a limited sample of states and equipment providers about the use of different technologies for release prevention and detection.[16]

Exhibit 2-4 identifies the total number of UST systems that could potentially be affected by each regulatory change in the proposed regulations, based on the baseline technology currently in place in the universe of systems. **Exhibit 2-4** identifies the number of UST systems or facilities with relevant technologies, the type of system (i.e., conventional UST and EGT systems, facilities with conventional UST systems or EGTs, AHFDSs, or FCTs), the proportion of the relevant universe of UST systems with the technology, and a summary of the assumptions that define the number of affected units. Note that proposed changes for AHFDSs, EGTs, and FCTs affect only those universes of facilities, and Energy Policy Act-related provisions affect only facilities and UST systems in Indian country.[17] See Appendix B for detailed descriptions of the values and sources used in each calculation. These estimates do not reflect baseline state regulations (e.g., whether a state already requires interstitial integrity testing). As discussed later in this chapter, some baseline state requirements satisfy requirements of the proposed rule.

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[16] E^2, Incorporated, memoranda and analyses submitted under Contract EP-W-05-018, "U.S. Environmental Protection Agency. Underground Storage Tanks/Leaking Underground Storage Tanks Analytical and Technical Support." Where gaps existed in the analyses, EPA used the best professional judgment of its UST system technical experts. All supporting materials not included in the appendices can be found in the docket for the proposed rule.

[17] EPA assumes that all states have adopted Energy Policy Act-related provisions in the baseline, consistent with existing guidance.

Exhibit 2-4

Potential Number And Type Of Units Affected By Each Regulation

Regulatory Change	Universe	Proportion of Total Universe Affected Annually	Number of Potentially Affected Systems (Annual) [a]	Assumptions
Release Prevention				
Walkthrough inspections	Facilities with Conventional UST systems and EGTs	100.0%	223,157 facilities	All facilities require periodic walkthrough inspections.
Overfill prevention equipment tests	Conventional UST systems and EGTs	100.0%	611,449 systems	Percentage of UST systems with overfill prevention equipment.
Spill prevention equipment tests	Conventional UST systems and EGTs	90.0%	550,304 systems	One-to-one spill prevention equipment to tank ratio, 10 percent have self-monitoring mechanism and do not need monitoring.
Interstitial integrity tests	Conventional UST systems and EGTs	17.5%	106,747 systems	Tanks and pipes that use interstitial monitoring and do not use continuous sensors, pressure, vacuum, or liquid-filled leak detection monitoring mechanisms. Includes five percent of tanks and 90 percent of piping that use interstitial monitoring.
Spill prevention equipment test after repair	Conventional UST systems and EGTs	6.3%	38,216 systems	Spill prevention equipment requires fix once every four years; repairs are used as the fix 25 percent of the time.
Overfill prevention equipment test after repair	Conventional UST systems and EGTs	5.0%	30,572 systems	Overfill prevention equipment requires fix once every five years; repairs are used as the fix 25 percent of the time.
Interstitial integrity test after repair	Conventional UST systems and EGTs	3.3%	20,443 systems	Tanks and pipes that use interstitial monitoring and do not use continuous sensors, pressure, vacuum, or liquid-filled leak detection monitoring mechanisms. Includes five percent of tanks and 90 percent of piping that use interstitial monitoring. Assumes 25 percent of pipes and five percent of tanks require repair every year.
Eliminate flow restrictors in vent lines for all new tanks and when overfill devices are replaced	Conventional UST systems and EGTs	6.5%	39,744 systems[b]	13% of new UST systems would have installed flow restrictors in vent lines.
Release Detection				
Operability tests – ATG	Conventional UST systems and EGTs	33.7%	205,814 systems	UST systems that use automatic tank gauges.
Operability tests – interstitial monitoring	Conventional UST systems and EGTs	18.8%	114,781 systems	UST systems that use interstitial monitoring (excluding five percent that conduct manual testing of the interstice).
Operability tests – line leak detection	Conventional UST systems and EGTs	27.5%	168,440 systems	Pressurized piping systems that use electronic line leak detectors.
Operability tests – mechanical LLDs	Conventional UST systems and EGTs	54.9%	335,628 systems	Proportion of pressurized piping that already performs a LLD test, but which will require additional capital expenditures to comply with new regulations.
Operability tests – groundwater and vapor monitoring	Conventional UST systems and EGTs	5.17%	31,612 systems	UST systems that use vapor monitoring and/or groundwater monitoring as their sole release detection method(s). Universe affected phases out in equal parts over initial five years of proposed rule.

Exhibit 2-4

Potential Number And Type Of Units Affected By Each Regulation

Regulatory Change	**Universe**	**Proportion of Total Universe Affected Annually**	**Number of Potentially Affected Systems (Annual)** [a]	**Assumptions**
Eliminate groundwater and vapor monitoring as release detection methods	Conventional UST systems and EGTs	5.17%	31,612 Systems	UST systems that use vapor monitoring and/or groundwater monitoring as their sole release detection method(s). Universe affected phases in over five years.
Add SIR/CITLD to regulations with performance criteria	Conventional UST systems and EGTs	0.5%	2,972 systems	13 percent of UST systems use SIR; 15 percent of these use qualitative methods. Of these, 25 percent are assumed to incur costs to comply.
Change release detection leak rate probabilities – ATG	Conventional UST systems and EGTs	33.7%	205,814 systems	UST systems that use automatic tank gauges.
Change release detection leak rate probabilities – LLD	Conventional UST systems and EGTs	27.5%	168,440 systems	Pressurized piping systems that use electronic line leak detectors.
Change release detection leak rate probabilities – SIR	Conventional UST systems and EGTs	1.9%	11,887 systems	UST systems that use qualitative SIR.
Change release detection leak rate probabilities – CITLD	Conventional UST systems and EGTs	25.2%	154,360 systems	33.7 percent of systems use ATG; of these, 75 percent employ CITLD.
Response to interstitial monitoring alarms	Conventional UST systems and EGTs	2.4%	14,814 systems	Weighted average annual percentage of UST systems and piping that experience an interstitial monitoring alarm.
Remove deferral for emergency generator tanks	EGTs	3.0%	18,343 systems	UST systems assumed to be emergency generator tanks.
Other				
Remove deferral for airport hydrant fuel distribution systems	AHFDSs	100.0%	162 facilities	All airport hydrant fuel distribution systems.
Remove deferral for UST systems with field-constructed tanks	FCTs	100.0%	239 systems	All UST systems with field-constructed tanks.
Require notification of ownership change	Facilities with Conventional UST systems and EGTs	10.1%	22,502 facilities	Annual number of facilities that change ownership.
Closure of lined tanks that cannot be repaired according to a code of practice	Conventional UST systems and EGTs	<0.1%	84 systems	Annual number of lined UST systems that cannot be repaired
Requirements for determining compatibility	Conventional UST systems and EGTs	100.0%	611,449	All conventional UST systems and EGTs
EPAct-related Provisions				
Operator training	UST Facilities in Indian country	100.0%	958 facilities	All facilities in Indian country. Universe affected phases in over three years.
Secondary containment - new and replaced tanks	UST systems in Indian country	36.2%	950 systems[b]	Approximately 72.4 percent of systems in Indian country are single-walled. Analysis assumes midpoint of time horizon until all units are replaced (year 10, 50 percent of universe affected).

Exhibit 2-4

Potential Number And Type Of Units Affected By Each Regulation

Regulatory Change	Universe	Proportion of Total Universe Affected Annually	Number of Potentially Affected Systems (Annual) [a]	Assumptions
Threshold for pipe replacement rather than repair	UST systems in Indian country	6.0%	158 systems[b]	Piping replaced every five years, where 60.3% are single-walled. Analysis assumes midpoint of time horizon until all units are replaced (year 10, 50 percent of universe affected).
Under-dispenser containment for all new dispensers	UST systems in Indian country	48.5%	1,273 systems[b]	Approximately 97 percent of systems require under-dispenser containment. Analysis assumes midpoint of time horizon until all units are replaced (year 10, 50 percent of universe affected).

[a] Figures in this column are calculated assuming that the average number of UST systems per facility is approximately 2.74, per "Summary of Key Data from State Public Record Postings," E^2, Incorporated, Task Order No. 1010 – Subtask A1-06C Technical Directive No. 36, Table 1.

[b] The affected universes presented for these items reflect 50 percent of ultimately affected systems or facilities. Because these requirements take effect over time and future costs are discounted, we present the universe affected at year 10 as a central estimate. In addition, we adjust unit costs to reflect the fact that the total cost of these requirements grows as the number of affected systems or facilities increases.

2.5 Facilities and Systems Affected by Proposed Rule

Many states currently have baseline regulations consistent with one or more requirements in the proposed regulations. As a result, only a portion of the universe of potentially affected facilities will be required to change practices to comply with each regulatory change. Whereas **Exhibit 2-4** displays the number of units that may potentially be subject to each requirement, **Exhibit 2-5** identifies, based on EPA's review of baseline state regulations, the number of units that will be subject to these requirements as a result of the proposed regulations. For nearly all requirements, some portion of the potentially affected universe is already in compliance with the proposed regulatory changes.

Alternative Option 2 will affect the smallest number of systems. Among the specific changes proposed, walkthrough inspections and spill prevention equipment tightness testing affect the largest number of UST systems in all scenarios.[18] In contrast, several regulatory changes (e.g., closure of irreparable lined tanks and pipe replacement requirements) are likely to affect only a small number of systems.

The distribution of incremental impacts of the rule also depends on the distribution of baseline technologies across states with different baseline regulations. Facilities and systems in states with fewer current regulations may bear a greater proportion of costs and benefits than facilities and systems in states with extensive baseline regulations. A key limitation of available baseline data is that baseline technology data is not available at the state level. For example, it is possible that facilities and systems with specific release detection technologies (e.g., automatic tank gauges, (ATGs)) may not be distributed evenly across all states. However, estimates of the

[18] Walkthrough inspections are estimated at a facility level; the number of UST systems estimated as affected by these regulations is 440,817.

percentage of systems using ATGs are available only at the national level. As a result, the regulatory scenarios in Chapters 3 (Compliance Costs) and Chapter 4 (Benefits and Cost Savings) reflect regulatory changes required by an "average" facility in a state under the proposed rule, assuming that all systems reflect the national profile of existing technologies. Analyses of economic impacts and small businesses in Chapter 5 (Distributional Analyses) assess the possible distribution of compliance impacts related to this uncertainty.

Exhibit 2-5

Estimated Systems Not Currently Regulated By States

Description	Universe of Potentially Affected Systems	Systems Affected by Preferred Option	Systems Affected by Alternative Option 1	Systems Affected by Option Alternative Option 2
Release Prevention				
Walkthrough inspections	223,157 (facilities)	160,882 (facilities)	160,882 (facilities)	141,505 (facilities)
Overfill prevention equipment tests [a]	611,449	378,672	421,137	378,672
Spill prevention equipment tests [a]	550,304	460,696	550,304	460,696
Interstitial integrity tests	106,747	76,157	93,538	N/A
Spill prevention equipment test after repair	38,216	37,847	37,847	37,847
Overfill prevention equipment test after repair	30,572	29,844	29,844	29,844
Interstitial integrity test after repair	20,443	14,585	14,585	14,585
Eliminate flow restrictors in vent lines for all new tanks and when overfill devices are replaced [b]	39,744	32,460	32,460	N/A
Release Detection				
Operability tests – ATG	205,814	201,874	201,874	201,874
Operability tests – interstitial monitoring	114,781	112,584	112,584	112,584
Operability tests – line leak detection	168,440	165,216	165,216	165,216
Operability tests – mechanical LLDs	335,628	335,628	335,628	335,628
Operability tests – groundwater and vapor monitoring	31,612	31,612	31,612	31,612
Eliminate groundwater and vapor monitoring as release detection methods [c]	31,612	31,612	31,612	31,612
Add SIR/CITLD to regulations with performance criteria	2,972	2, 882	2, 882	2, 882
Change release detection leak rate probabilities – ATG	205,814	N/A	201,874	N/A
Change release detection leak rate probabilities – LLD	168,440	N/A	165,216	N/A
Change release detection leak rate probabilities – SIR	11,887	N/A	11,659	N/A
Change release detection leak rate probabilities – CITLD	154,360	N/A	151,406	N/A
Response to interstitial monitoring alarms	14,814	10,569	10,569	10,569
Remove deferral for emergency generator tanks	18,343	11,704	11,704	N/A
Other				
Remove deferral for airport hydrant fuel distribution systems	162 [d]	97	97	N/A
Remove deferral for UST systems with field-constructed tanks	239	102	102	N/A
Require notification of ownership change	22,502 (facilities)	3,265 (facilities)	3,265 (facilities)	3,265 (facilities)
Closure of lined tanks that cannot be repaired according to a code of practice	84	59	59	59
Requirements for determining compatibility	611,449	611,449	611,449	611,449
EPAct-related Provisions				
Operator training	958 (facilities)	958 (facilities)	958 (facilities)	958 (facilities)
Secondary containment - new and replaced tanks [b]	950	950	950	950
Threshold for pipe replacement rather than repair [e]	158	0	0	0

Exhibit 2-5

Estimated Systems Not Currently Regulated By States

Description	Universe of Potentially Affected Systems	Systems Affected by Preferred Option	Systems Affected by Alternative Option 1	Systems Affected by Option Alternative Option 2
Under-dispenser containment for all new dispensers [b]	1,273	1,273	1,273	1,273

[a] The universe of affected systems for these requirements varies because some states have current requirements that differ in frequency and ensure baseline compliance in some regulatory scenarios but not others.

[b] The affected universes presented for these items reflect 50 percent of ultimately affected systems or facilities. Because these requirements take effect over time and future costs are discounted, we present the universe affected at year 10 as a central estimate. In addition, we adjust unit costs to reflect the fact that the total cost of these requirements grows as the number of affected systems or facilities increases.

[c] Universe affected phases in over five years.

[d] The universe of potentially affected units is 162 systems, or 1,296 tanks (at eight tanks per system).

[e] EPA's screening analysis shows that a requirement to replace piping if more than 50 percent of it requires repairs would likely generate no net costs, as owners or operators would ordinarily pursue replacement under those circumstances. See Appendix C for details.

Chapter 3. Assessment of Compliance Costs

3.1 Introduction

This chapter describes EPA's analysis of the social costs associated with the proposed rule. OMB guidance suggests that an analysis that relies on measures of opportunity cost and willingness to pay provides a holistic basis for assessing the total cost of any proposed rule. Specifically, a social cost analysis should focus on measuring changes in consumer and producer surplus by considering the market responses to compliance costs (e.g., changes in demand and supply). Along with the administrative costs incurred by the government, changes in producer and consumer surplus reflect the true cost to society of adopting a set of proposed measures.

For this regulatory impact analysis, EPA uses a combination of direct compliance costs and state oversight costs to approximate social costs. In this context, compliance costs represent a reliable indicator of social costs for the following reasons:

- The regulatory requirements generally focus on additional testing and inspection of existing equipment, and do not reflect large-scale investments in equipment or significant changes to operations at the facility level. In addition, the facilities affected by the rule are distributed with relative geographic uniformity for consumers and producers.

- Given the small per-facility costs of the rule (less than $900 for the average facility, as documented in this chapter), closures or changes in market structure represent an unlikely response to the rule. Therefore, it is unlikely that significant changes to production or consumer behavior will affect social costs.

- The short- and long-run impacts of the rule are not likely to differ significantly. Testing and inspection requirements under the rule may offer some opportunities for owners and operators to reduce costs by learning over time, but they are not likely to reduce costs enough to facilitate large-scale equipment upgrades.

For these reasons, compliance costs are likely to be a reasonable approximation for social costs over both the short- and long-run. This chapter presents EPA's compliance cost methodology and results, and summarizes the calculation of government oversight costs. The chapter also provides a discussion of key uncertainties and several brief sensitivity analyses. An analysis of the potential economic impacts of the proposed rule is presented in Chapter 5, and a sensitivity analysis that evaluates the effects of alternative interest rates is presented in Chapter 7.

3.2 Compliance Cost Methodology

In this chapter, EPA presents its methodology for estimating incremental compliance costs of the proposed rule beyond the current baseline costs of existing federal and state regulation of underground storage tanks. EPA's analysis focuses on the specific incremental costs that occur as a consequence of the proposed rule.[1] Throughout this chapter, the analysis distinguishes between three types of costs:

- System-level: Costs that occur at the individual UST tank level, including ancillary equipment.
- Facility-level: Costs that occur at the level of a facility that owns several USTs; typically 2.74 times the system-level cost to reflect UST ownership by the average facility.
- Unit costs: System-level costs related to a particular proposed requirement. For example, the requirement to test spill prevention equipment after repairs has a unit cost of approximately $130.

Calculation of total incremental compliance costs for UST facilities reflects two key components: identification of specific measures necessary for compliance at individual facilities, and calculation of the costs associated with each of these measures. To estimate these costs, EPA developed a compliance cost model that identifies incremental equipment and labor requirements for an individual system. Based on the baseline equipment, existing state regulations, and anticipated responses to the proposed regulation, the model then generates system-specific estimates of compliance costs. Compliance costs include the labor and capital costs associated with new equipment and installation, inspection, testing, and recordkeeping. The model also includes other compliance costs, such as those associated with more frequent detection of equipment failure and repair of equipment. Some component costs are specific to individual UST system configurations – for example, airport hydrant fuel distribution systems or UST systems with field-constructed tanks – while others are consistent across all system types.

We calculate the compliance costs of the proposed rule by measuring three factors: the regulations already in place in each state (i.e., baseline regulations); the proportion of facilities or UST systems with specific technologies (i.e., the portion of systems that require specific types of upgrades or tests); and the unit cost to comply with each proposed element of the proposed regulation. Chapter 2 of this regulatory impact analysis discusses the baseline state regulations and the proportion of facilities affected by this rule (see **Exhibit 2-5**).

An important limitation of our analysis is that we do not have data on the distribution of UST technologies. Consider the following from **Exhibit 2-5**: we estimate that overfill prevention tests will be a new requirement for 378,672 systems, and spill prevention equipment tests will be a new requirement for 460,696 systems. These requirements could together affect as few as 460,696 systems if all systems that are affected by overfill prevention testing are a subset of the systems that are affected by spill prevention testing. In the absence of additional information, it

[1] For this proposed rule, EPA does not specifically attempt to measure baseline regulatory costs. However, costs identified in the 1988 EPA regulation that set original technical standards under 40 CFR Part 280 provide an indication of baseline costs. The 1988 RIA calculated per-tank costs of $28,770, equivalent to $44,450 in 2009 dollars. See August 24, 1988 RIA entitled Regulatory Impact Analysis of Technical Standards for Underground Storage Tanks, Volume 1, page ES-7, Exhibit ES-1).

is equally plausible that these two requirements affect the entire universe of USTs if they overlap as little as possible.

EPA has not identified any information that could allow us to reliably narrow the universe of affected USTs to a number smaller than the entire universe. Further, EPA's review of state data suggests that facilities in all states will be subject to some cost under the proposed rule.[2] Consequently, when considering the total cost of the proposed rule on a facility or UST system basis, we divide the total cost by the number of facilities or systems in the entire universe.[3]

3.2.1 Categories of Compliance Costs Analyzed

This analysis includes the following categories of compliance costs: operations and maintenance costs; capital costs; and implicit capital costs, or "time value of money costs" associated with earlier detection of equipment failure. Because the proposed rule focuses on operational improvements, operations and maintenance costs constitute the majority of the compliance costs identified in this analysis. These costs are relatively frequent, recurring costs that mainly involve a service activity. Operations and maintenance activities include the labor and materials costs associated with maintenance of equipment, routine testing, and inspection (whether performed by the owner, operator, or a contractor). This analysis assumes that UST facility owners and operators pay in full for these costs when they occur (that is, they do not obtain financing and pay over time).[4]

Because the proposed rule does not focus on broad equipment requirements, capital costs represent a small portion of the total compliance costs for this proposed rule. Capital costs address the purchase and installation of new equipment, such as installing a new double-walled UST or under-dispenser containment. Total capital costs typically include installation labor and initial service required to ensure the new equipment is fully functioning. EPA assumes that UST owners and operators finance these compliance costs over the life of the equipment; all capital costs are calculated over a regulatory time horizon of 20 years.[5] The following examples characterize the three types of capital cost calculations that are relevant to this regulatory analysis:

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[2] The discounted cost per UST system ranges from less than $100 in one state to over $700, with costs in 54 states and territories falling between $200 and $450.

[3] We address uncertainty in the distribution of technology and costs with a set of sensitivity analyses in section 3.5 of this chapter, and we consider the economic impacts of different distributions of costs in Chapter 5.

[4] Certain one-time costs that occur only once over the regulatory time horizon (e.g., one-time spending on initial operator training for personnel at existing facilities) are also annualized over 20 years.

[5] EPA assumes that owners and operators amortize all capital costs over a 20-year expected regulatory horizon to be consistent with the 20-year expected lifetime of an UST system. For equipment with a lifetime shorter than 20 years, EPA assumes that a proportion of the universe is affected per year; for example, EPA assumes that piping is replaced every five years, such that one-fifth of the universe must replace it every year. The central analysis uses a seven percent discount rate, consistent with Office of Management and Budget Circular No. A-94, Revised, October 29, 1992. Other discount rates are considered in Chapter 7.

Existing equipment replacements: An UST system owner or operator must upgrade an existing system with new equipment to comply with a requirement under the proposed rule (e.g., facilities with EGTs may be required to install release detection equipment if the deferral is removed). The incremental compliance cost is the total cost of the new equipment and installation (including removal of existing equipment).[6] Any additional (incremental) operation and maintenance costs are also included.

New equipment requirements: An operator is installing new or replacement equipment as an ordinary business expense. Under baseline regulations, *Equipment A* is compliant. However, new regulations require a higher level of compliance for new tank systems that can be satisfied at lowest cost by *Equipment B.* The incremental compliance cost to the owner of the equipment is the additional cost (if any) of purchasing and installing and operating *Equipment B* instead of *Equipment A.* The costs of this requirement reflect the timing of the normal replacement cycle for all equipment in the universe. For example, owners and operators installing new UST systems will be required to use technologies other than flow restrictors to ensure release prevention.

Time value of money (TVM) costs: Under baseline regulations, the average UST system requires inspection every three years. EPA estimates that the baseline three-year inspection, on average, identifies a hypothetical repair or replacement cost of $100 associated with certain equipment. Under the proposed rule, a new annual test would discover the repair sooner and require repair or replacement one-to-two years earlier. While the repair expense is the same, the proposed rule generates a time value of money cost by requiring an expenditure sooner.[7]

EPA estimates that the proposed regulations will impose capital costs on the following components due to earlier detection of problems as a result of the new testing requirements:

- Overfill prevention equipment;
- Spill prevention equipment;
- Interstitial areas; and

[6] This approach may overstate costs, as it does not account for the age of existing equipment. Owners and operators typically plan for new capital expenditures over the lifetime of existing equipment, recording depreciation as operations consume its usefulness over time. If an owner or operator is close to replacing certain equipment and is required to replace that equipment when the proposed rule becomes effective, he or she incurs a lower incremental cost than an owner or operator who only recently installed that equipment. By not attempting to adjust for this factor, EPA assumes that owners and operators replace brand new equipment, a conservatism that results in a higher cost. Using this approach, these annualized one-time costs comprise approximately one percent of annual costs under Preferred Option and Alternative 2. Under Alternative 1, the requirement of three-year spill prevention equipment replacement increases these costs to 38 percent of total costs.

[7] There is significant uncertainty regarding whether total expenditures would increase or decrease over time. More frequent inspections may lead to more frequent repairs and replacements but may also reduce the severity and cost of issues.

- ATGs, interstitial monitors, vapor monitors, groundwater monitors, and line leak detectors.

The proposed rule requires testing, in addition to inspections, for several UST system components. EPA assumes that testing adds value to baseline release prevention strategies in two ways: first, testing detects issues with an UST system that may not be detectable in inspections. In addition, in some cases, testing will occur more frequently than baseline inspections and therefore may identify issues that occur between inspections. This analysis therefore considers two types of increased capital costs. First, EPA assumes that additional testing required under the proposed rule will identify malfunctions that prior inspections would have overlooked, and will therefore mandate additional compliance costs related to repair and replacement of equipment. Second, some baseline compliance costs will occur earlier than they would in the baseline, creating time value of money costs as owners and operators forgo the use of funds for other investments. The time value of money cost of incurring a repair sooner is estimated at seven percent, consistent with OMB's discount rate. See Appendix D for the detailed cost methodology.

3.2.2 Estimation of System-Level Compliance Costs for UST Systems

Estimates of system-level compliance costs for each part of the proposed rule are based on publicly available data on equipment, installation, and testing costs, information collected from professionals in industries that provide relevant equipment and services, and EPA's professional judgment.[8] Costs are estimated to occur according to the rule implementation schedule identified in **Exhibit 1-2**; we use an annual discount rate of seven percent to adjust costs with compliance windows of more than one year.

Labor costs used in this analysis reflect labor-hour estimates from EPA Information Collection Request 1360.08 for specific inspection and recordkeeping tasks. The cost of labor is based on Bureau of Labor Statistics (BLS) labor rates for skill categories appropriate to the retail sector and technical requirements of the proposed rule.[9] In particular, EPA selected labor rates that correspond to categories of labor employed in the retail motor fuels sector (NAICS 447).

The analysis adjusts these rates using a 12 percent overhead factor and a fringe benefits factor of 28.3 percent, which is specific to service-providing industries.[10] For requirements that are likely

[8] E^2, Incorporated, memoranda and analyses submitted under Contract EP-W-05-018, "U.S. Environmental Protection Agency. Underground Storage Tanks/Leaking Underground Storage Tanks Analytical and Technical Support." Where gaps existed in the analyses, EPA used the best professional judgment of its UST system technical experts. All supporting materials not included in the appendices can be found in the docket for the proposed rule.

[9] Labor rates reflect the May 2008 Occupational Employment and Wage publication by the Bureau of Labor Statistics. See Appendix D for the particular Standard Occupational Classification codes used. EPA does not use the costs in its Information Collection Request 1360.08 because those labor rates reflect all industries and do not represent typical costs to the majority of UST owners and operators.

[10] The overhead factor of 12 percent comes from Office of Management and Budget Circular No. A-76, p. D-7. Although this rate reflects government overhead rates, we believe it is also representative of the low-overhead structure of the retail motor fuels sector. The fringe benefits factor is from Bureau of Labor Services, Employer Costs for Employee Compensation, September 2009. See Table 10: All workers, service-providing industries.

to be satisfied by third-parties, such as testing, labor costs are included in the costs of those services.

In addition, specific requirements under the proposed regulation are addressed as follows:

- For proposed regulatory changes that take effect over time as equipment ages, the analysis assumes a constant rate of equipment replacement, and calculates a constant annual payment for the net present value of 20 years of replacements. Appendix D discusses the specific assumptions made in the analysis.

- To identify the total system-level compliance cost of removing deferrals from airport hydrant fuel distribution systems (AHFDSs) and field-constructed tanks (FCTs), the analysis calculates both the direct costs of removing the deferral of these systems from the regulations under 40 CFR Part 280, and the additional costs of complying with other new regulatory options that apply to all systems (and become relevant when deferrals are removed). Under the proposed regulations, owners and operators of these systems must perform annual bulk line testing at prescribed rates or use an automatic tank gauge at prescribed leak rates. Appendix A discusses specific assumptions related to these tank populations.

- To estimate the total system-level compliance cost of removing the deferral from emergency generator tanks, the analysis calculates the cost of complying with specific proposed changes that apply to the broader universe of conventional UST systems and become relevant when the deferral is removed. Removal of the deferral under the proposed rule means that EGTs must comply with release detection requirements at 40 CFR Part 280, Subpart D.

Exhibit 3-1 presents the unit-level costs for the individual requirements in the proposed rule.[11]

[11] See Appendix D for a detailed discussion of these costs.

Exhibit 3-1

Unit Costs For The Requirements In The Proposed Rule[i]

	ONE-TIME [a] ($)	O&M ($)	REPAIR/REPLACEMENT COST [b] ($)
Release Prevention			
Walkthrough inspections	$0.00	$25.36	$0.13
Overfill prevention equipment tests	$0.00	$214.69	$11.00
Spill prevention equipment tests	$0.00	$125.68	$3.34
Interstitial integrity tests	$0.00	$310.25	$126.10
Spill prevention equipment test after repair	$0.00	$125.68	$0.00
Overfill prevention equipment test after repair	$0.00	$214.68	$0.00
Interstitial integrity test after repair	$0.00	$157.78	$0.00
Eliminate flow restrictors in vent lines for all new tanks and when overfill devices are replaced	$394.20	$0.00	$0.00
Release Detection			
Operability tests – ATG	$0.00	$56.17	$1.12
Operability tests – interstitial monitoring	$0.00	$9.93	$1.16
Operability tests – electronic LLDs	$0.00	$56.17	$2.15
Operability tests – mechanical LLDs	$0.00	$0.00	$0.77
Eliminate groundwater and vapor monitoring as release detection methods	$68.89 [c]		
Add SIR/CITLD to regulations with performance criteria	$10.00	$0.00	$0.00
Change release detection leak rate probabilities – ATG	$2,431.37	-$8.00 [f]	$0.00
Change release detection leak rate probabilities – LLD	$412.39	-$12.00 [f]	$0.00
Change release detection leak rate probabilities – SIR	$15.00	-$2.40 [f]	$0.00
Change release detection leak rate probabilities – CITLD	$80.00	-$1.60 [f]	$0.00
Response to interstitial monitoring alarms	$0.00	$78.19	$0.00
Remove deferral for emergency generator tanks [h]	$298.56	$172.74	
Other			
Remove deferral for airport hydrant fuel distribution systems	$11,281.20	$229,837.14	$0.00
Remove deferral for UST systems with field-constructed tanks	$12.83	$55,474.81	$0.00
Require notification of ownership change	$0.00	$12.83	$0.00
Closure of lined tanks that cannot be repaired according to a code of practice	$35,499 [d]	$0.00	$0.00
Requirements for determining compatibility	$0.00	$1.89 [g]	$0.00
EPAct-related Provisions			
Operator training	$265.89	$130.80	$0.00
Secondary containment - new and replaced tanks	$7,890.18	$0.00	$0.00
Threshold for pipe replacement rather than repair [e]	$0.00	$0.00	$0.00
Under-dispenser containment for all new dispensers	$1,795.11	$0.00	$0.00

[a] One-time costs presented here are not shown in annual terms. For the purposes of estimating total annual costs for the proposed rule, these one-time expenditures are annualized over 20 years at a seven percent interest rate.

[b] Time value of money costs due to earlier repair and replacement of equipment reflect costs of repair or replacement sooner than would have occurred in the baseline. For most requirements, these are costs that would occur and be identified by annual tests, i.e., they reflect one year's worth of accumulated issues that require equipment repairs or replacements. Three requirements represent exceptions. TVM costs for overfill prevention and interstitial integrity testing, which occur every three years under the Preferred Option, represent the repairs and replacements over three years. In addition, TVM costs for

Exhibit 3-1 **Unit Costs For The Requirements In The Proposed Rule**[i]			
	ONE-TIME [a] **($)**	**O&M ($)**	**REPAIR/REPLACEMENT COST** [b] **($)**

walkthrough inspections represent the repairs and replacements identified on a monthly basis to match the requirement under the Preferred Option. See Appendix D for additional details.

[c] The cost presented here is the average unit cost for the phasing out of groundwater and vapor monitoring and the phasing in of alternative compliance methods. It includes elements of annualized one-time costs and O&M costs.

[d] We assume that this cost occurs in full for the systems that require closure of lined tanks in a given year.

[e] We assume all facilities exceeding the 50 percent threshold for piping replacement would opt to replace piping in the baseline; costs are therefore zero. See Appendix C for detailed calculations.

[f] Operations and maintenance costs associated with the adjustment of release detection leak rate probabilities is negative because operators avoid costly testing related to false alarms.

[g] This includes an annualized cost of $0.01 related to the cost of storing records for the life of the UST system.

[h] Because different subsets of EGTs are subject to different requirements, we present average unit costs that divide the total cost to the affected universe by the total number of affected units. O&M costs include any TVM costs associated with operability tests. See Appendix D for additional details.

[i] Cost estimates were derived using a seven percent discount rate.

3.3 Calculation of Incremental Compliance Costs

This analysis estimates the compliance cost of the proposed rule by calculating the incremental cost of each regulatory change on the population of tank systems in every U.S. state and territory. This procedure relies on national estimates of the universe of systems employing specific baseline technologies, as well as EPA's assessment of the baseline regulatory requirements in each state and territory.[12] The analysis categorizes compliance costs into one-time or operations and maintenance costs and amortizes one-time compliance costs over the 20-year regulatory time horizon.[13] As a final step, it discounts annual compliance costs associated with several of the proposed changes to delayed compliance horizons specified in the proposed rule (e.g., overfill operability testing must be performed within three years of the date the proposed rule becomes effective).

To calculate compliance costs, EPA employs a number of assumptions, some of which likely overstate compliance costs:

- **Time value of money costs**. This analysis does not assume that the rate at which problems occur in UST systems will decline as a result of the proposed rule. The number and severity of problems will likely fall due to more frequent testing and inspections, but the rate of decline is uncertain and the analysis does not attempt to adjust for these changes. This likely causes the analysis to overestimate the costs of the proposed rule.

[12] For details regarding these assumptions, see Appendix B.

[13] See footnote 5 for an explanation of the use of a 20-year time horizon.

- **Size of universe**. EPA's analysis assumes that the number of UST systems in the universe remains constant over time, with new systems replacing closures. EPA's end-of-year reporting data reveal that the universe of conventional UST systems has declined at a rate over two percent per year since 1999.[14] Assuming this pattern continues, future annual compliance costs due to the proposed rule are likely to be lower than estimated in this analysis. However, in absence of other data we assume that new installations and upgrades will offset all closures, and that annual compliance costs will remain constant. Impacts of assuming an alternative baseline universe of UST systems that declines over time are discussed in Sections 3.3.1 and 3.4.1.

- **Full compliance.** EPA assumes that all owners and operators subject to each requirement will come into compliance. This ensures a high estimate of costs, as each system subject to the rule implements the required measures and consequently incurs the related costs.

- **Timeliness of repairs.** EPA assumes that all issues identified through testing of equipment will be properly addressed through immediate repair or replacement of equipment. This may overstate costs if owners or operators fail to address identified issues in a timely fashion.

- **Date on which costs are incurred.** EPA assumes that all costs are incurred at the beginning of the year in which each requirement of the proposed rule becomes effective. This may overstate costs that occur at the end of the time frame.

These combined assumptions help ensure that the total costs estimated in each scenario below are not likely to be understated, even in cases where some uncertainty is associated with unit cost estimates for equipment or testing. Two key areas of uncertainty that affect the distribution of costs are noted below.

- **Geographic distribution of technologies:** EPA lacks information on how UST systems with specific equipment (e.g., ATG) are distributed nationally. If most are located within states with existing applicable requirements, then costs could be lower (conversely, if most are located in states with no existing applicable requirements, then costs could be higher). In the absence of this data, EPA assumes a uniform distribution of technologies across all states. EPA assesses the extent to which this assumption creates cost uncertainty at the end of this chapter.

- **Distribution of costs across systems:** EPA does not have information on how costs are likely to be distributed among the systems that are subject to new requirements. For example, a correlation among systems that require overfill operability testing, spill prevention equipment tightness testing, and interstitial integrity testing after repair would concentrate costs on these systems in ways that

[14] See U.S. Environmental Protection Agency, Office of Underground Storage Tanks, Semi-Annual Report of UST Performance Measures for Fiscal Years 1999 and 2009. In addition, industry data indicates that in recent years, the net decline in the population of facilities with UST systems has been roughly 1.4 percent per year.

EPA's primary assessment of costs does not capture. While this does not affect total cost estimates, EPA assesses the distributional consequences of an outcome where costs are highly-concentrated in Chapter 5.

3.3.1. Calculation of Incremental Compliance Costs Using an Alternative Baseline

EPA's primary analysis assumes that the universe of UST systems stays constant over time. That is, the analysis assumes that when an UST system enters the universe, another exits, and vice versa. However, data show that the universe of UST systems has been declining over the past two decades (albeit at a slowing rate). Therefore, EPA also assesses compliance costs associated with the proposed rule based on an alternative baseline that projects a declining universe.

To calculate the rate of universe decline, EPA mapped historical data on the universe of UST systems from 1991 through 2010 to an exponential one-phase decay function, which appears to most accurately represent the observed behavior of the UST system universe over time.[15] Steep declines in the universe of UST systems in past years reflect increases in tank size as well as industry consolidation. However, these declines may be reaching functional limits, both because the number of fuel outlets needed to serve the population is considerable, and because tank sizes may be reaching a practical limit in their ability to be transported and installed.[16,17]

The function used to project future UST universe sizes indicates that over a 20-year time period, the annual number of affected UST systems gradually declines to 586,021 UST systems by year 20 under this alternative baseline.[18] The number of UST systems affected under this alternative baseline is approximately 97 percent of the size of the original baseline, which assumes a constant universe size of 611,449 UST systems over this period. As a result, compliance costs associated with the proposed rule are only marginally smaller under this alternative baseline. See Appendix J for additional details.

[15] To estimate future UST universe sizes, we used a single exponential decay function, which assumes that a quantity declines at a rate proportional to its value. This is an appropriate function given the singular and slowing rate of decline observed in the universe of UST systems over time. The equation for such an exponential singular decay function is $Y = (Yo - P) * e^{(-k*X)} + P$, where P represents the "plateau," or limit of the function and k represents the function's half-life. (See Appendix J for additional details.)

[16] See Wayne Geyer, "Where Has Our Petroleum Storage Capacity Gone?" Steel Tank Institute, https://www.steeltank.com/LinkClick.aspx?fileticket=h8g9YO5y%2BfI%3D&tabid=108&mid=502. This source indicates simultaneous trends in increasing average tank sizes as well as decreasing UST system totals.

[17] While this alternative baseline assumes a steady decline in the number of UST systems, it is possible that the number of UST systems may actually increase in the future to trend with population growth and economic expansion as more people living in more areas may necessitate more retail motor fuel outlets.

[18] EPA assumes that owners and operators amortize all capital costs over a 20-year expected regulatory horizon to be consistent with the 20-year expected lifetime of an UST system.

3.4 Results of Assessment of Compliance Costs

Exhibit 3-2 presents a summary of the estimated incremental compliance costs associated with the proposed rule by type of UST system affected. In all options, it is clear that the category of conventional UST systems will bear the largest proportion of compliance costs under the proposed rule. While compliance costs associated with removal of deferrals from EGTs are constant across regulatory scenarios, other costs vary substantially among the regulatory options. The model parameters used to produce the results discussed in this chapter are presented in Appendix E and were selected to reflect the preferred and alternative options described in Chapter 1**.**

Exhibit 3-2

Total Annual Compliance Costs Of The Proposed Rule For UST Systems Affected[c]

Option	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Conventional UST systems [a]	$180	$360	$120
Emergency Generator Tanks (EGTs) [b]	$2.2	$2.2	$2.1
Airport Hydrant Fuel Distribution Systems (AHFDSs)	$18	$120	$0.0
UST systems with Field-Constructed Tanks (FCTs)	$4.6	$33	$0.0
Total	**$200**	**$520**	**$120**

[a] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[b] Costs for EGTs are lower in Alternative 2 because operability testing is performed every 3 years versus every year under other options.
[c] Cost estimates were derived using a seven percent discount rate.

Exhibit 3-3 presents a disaggregation of compliance costs under each regulatory option. The following areas contribute significantly to the differences in compliance costs among the alternatives.

- **Release prevention**: The greatest difference in compliance costs between Alternative 1 and the Preferred Option is related to release prevention; specifically, due to the combination of walkthrough inspections, overfill prevention equipment tests, spill prevention equipment tests, and interstitial integrity tests, and testing after repairs. These requirements account for 55 percent and 73 percent of total compliance costs, respectively. This variation is largely dependent on the testing or inspection frequency required under each alternative.

- **Removal of deferrals for AHFDSs and UST systems with FCTs**: Removal of deferrals for AHFDSs and FCTs is accompanied by tightness testing of equipment that varies in frequency depending on the alternative. This tightness test drives most of the variation in compliance costs. Under the Preferred Option, total costs for these systems are $23 million, or approximately 11 percent of total compliance costs; under Alternative 1, total costs are $153 million or approximately 29 percent of total compliance costs.[19] Alternative 2 maintains the deferrals and therefore has no incremental compliance cost.

- **Operability tests for release detection methods**: The Preferred Option and Alternative 1 each require annual testing of the operability of release detection systems, while Alternative 2 requires these tests every three years. Operability testing costs approximately $21 million under both the Preferred Option and Alternative 1, though they constitute 11 percent of total compliance costs for the Preferred Option and only four percent of total compliance costs for Alternative 1. Three-year testing under Alternative 2 (which includes operability tests for groundwater and vapor monitoring since they would remain as release detection methods) costs approximately $8 million, or about seven percent of total compliance costs for that option.

In total, these categories represent approximately 90 percent of the total compliance costs for each option. In addition, the adjustment of release detection leak rate probabilities under Alternative 1 constitutes most of the remaining 10 percent of costs for that option.

EPA determines average compliance costs per system by dividing the total cost of the proposed rule by the total 611,449 systems in the regulated universe of conventional UST systems and EGTs. EPA's analysis shows that the compliance cost for this proposed rule is $300 per system, or approximately $890 per typical facility among motor fuel retailers, the sector with the highest average number of UST systems per facility.[20]

Exhibit 3-4 presents the same total costs as **Exhibit 3-3** but shows the number of systems affected and the cost of the requirement per affected system. The costs in this exhibit reflect annualized one-time costs, discounting, and adjustments for the adoption of certain requirements over time (e.g., elimination of flow restrictors for new and replaced tanks), and therefore differ from the unit costs presented in **Exhibit 3-1**. It is important to note that the unit costs in **Exhibit 3-4** cannot be summed to obtain a cost per system, as nearly all systems are already in compliance with some requirements of the proposed rule.

[19] In addition, Alternative 1 calls for tightness testing at a lower leak rate. See Appendix A for details.

[20] The $300 estimate excludes costs associated with removal of deferrals for AHFDSs and UST systems with FCTs, assumes 2.97 systems per retail motor fuel facility, and includes the cost of $23 per facility for them to review the regulation. This approach does not address variability of baseline compliance across systems; to assess uncertainty associated with this approach, EPA presents a sensitivity analysis in Chapter 5.

Exhibit 3-3

Annual Compliance Costs Due To The Proposed Rule For UST Systems Affected
All values in $ thousands[i]

Description	Preferred Option			Alternative 1			Alternative 2		
	Capital Cost (Annualized)	**O&M**	**Total Cost**	**Capital Cost (Annualized)**	**O&M**	**Total Cost**	**Capital Cost (Annualized)**	**O&M**	**Total Cost**
Release Prevention									
Walkthrough inspections	$0.0	$46,000.0	$46,000.0	$0.0	$46,000.0	$46,000.0	$0.0	$14,000.0	$14,000.0
Periodic testing of: - Overfill prevention equipment - Spill prevention equipment [a] - Interstitial integrity	$0.0	$87,000.0	$87,000.0	$0.0	$230,000.0	$230,000.0	$0.0	$78,000.0	$78,000.0
Testing after repairs to spill and overfill prevention equipment, and interstices [b]	$0.0	$13,000.0	$13,000.0	$0.0	$8,700.0	$8,700.0	$0.0	$13,000.0	$13,000.0
Elimination of flow restrictors in vent lines for all new tanks and when overfill devices are replaced	$1,200.0	$0.0	$1,200.0	$1,200.0	$0.0	$1,200.0	N/A	N/A	N/A
Subtotal – Release Prevention [g]	**$1,200.0**	**$146,000.0**	**$147,200.0**	**$1,200.0**	**$284,700.0**	**$285,900.0**	**$0.0**	**$105,000.0**	**$105,000.0**
Release Detection									
Operability tests for release detection methods	$0.0	$21,000.0	$21,000.0	$0.0	$21,000.0	$21,000.0	$0.0	$7,900.0	$7,900.0
Eliminate groundwater and vapor monitoring as release detection methods			$2,000.0			$2,300.0	N/A	N/A	N/A
Add SIR/CITLD to regulations with performance criteria	$2.7	$0.0	$2.7	$2.7	$0.0	$2.7	$2.7	$0.0	$2.7
Remove deferral for emergency generator tanks [c]	$310.0	$1,900.0	$2,200.0	$310.0	$1,900.0	$2,200.0	$310.0	$1,800.0	$2,100.0
Change release detection leak rate probabilities [d]	N/A	N/A	N/A	$53,000.0	-$3,800.0	$50,000.0	N/A	N/A	N/A
Response to interstitial monitoring alarms	$0.0	$830.0	$830.0	$0.0	$830.0	$830.0	$0.0	$830.0	$830.0
Subtotal – Release Detection [g]	**$312.7**	**$23,730.0**	**$26,032.7**	**$53,312.7**	**$19,930.0**	**$76,332.7**	**$312.7**	**$10,530.0**	**$10,832.7**
Other									
Remove deferral for airport hydrant fuel distribution systems [e]	$85.0	$18,000.0	$18,000.0	$85.0	$120,000.0	$120,000.0	N/A	N/A	N/A

Exhibit 3-3

Annual Compliance Costs Due To The Proposed Rule For UST Systems Affected
All values in $ thousands[i]

Description	Preferred Option			Alternative 1			Alternative 2		
	Capital Cost (Annualized)	**O&M**	**Total Cost**	**Capital Cost (Annualized)**	**O&M**	**Total Cost**	**Capital Cost (Annualized)**	**O&M**	**Total Cost**
Remove deferral for UST systems with field-constructed tanks	$0.0	$4,600.0	$4,600.0	$0.0	$33,000.0	$33,000.0	N/A	N/A	N/A
Require notification of ownership change	$0.0	$42.0	$42.0	$0.0	$42.0	$42.0	$0.0	$42.0	$42.0
Closure of lined tanks that cannot be repaired according to a code of practice [f]	$0.0	$2,100.0	$2,100.0	$0.0	$2,100.0	$2,100.0	$0.0	$2,100.0	$2,100.0
Requirements for determining compatibility	$11.0	$1,200.0	$1,200.0	$11.0	$1,200.0	$1,200.0	$11.0	$1,200.0	$1,200.0
Subtotal – Other [g]	**$96.0**	**$25,942.0**	**$25,942.0**	**$96.0**	**$156,342.0**	**$156,342.0**	**$11.0**	**$3,342.0**	**$3,342.0**
EPAct-related Provisions									
Operator training	$23.0	$120.0	$140.0	$23.0	$120.0	$140.0	$23.0	$120.0	$140.0
Secondary containment	$920.0	$0.0	$920.0	$920.0	$0.0	$920.0	$920.0	$0.0	$920.0
Subtotal – EPAct-related Provisions [g]	**$943.0**	**$120.0**	**$1,060.0**	**$943.0**	**$120.0**	**$1,060.0**	**$943.0**	**$120.0**	**$1,060.0**
Subtotal [g]	**$2,600.0**	**$200,000.0**	**$200,000.0**	**$56,000.0**	**$460,000.0**	**$510,000.0**	**$1,300.0**	**$120,000.0**	**$120,000.0**
Additions for new units (beyond those included above) [h]	$4.6	$0.0	$4.6	$750.0	$0.0	$750.0	$4.6	$0.0	$4.6
Total [g]	**$2,600.0**	**$200,000.0**	**$200,000.0**	**$57,000.0**	**$460,000.0**	**$520,000.0**	**$1,300.0**	**$120,000.0**	**$120,000.0**

Exhibit 3-3

Annual Compliance Costs Due To The Proposed Rule For UST Systems Affected
All values in $ thousands[i]

Description	Preferred Option			Alternative 1			Alternative 2		
	Capital Cost (Annualized)	O&M	Total Cost	Capital Cost (Annualized)	O&M	Total Cost	Capital Cost (Annualized)	O&M	Total Cost

[a] Alternative 1 calls for spill prevention equipment replacement every three years. For analytical convenience, we annualize the cost of replacement over three years and incorporate it as an O&M cost.

[b] Costs fall under Alternative 1 compared with the Preferred Option because replacement of spill prevention equipment every 36 months will eliminate the need for repairs to such equipment.

[c] Costs related to removal of deferrals for the regulation of emergency generator tanks include the cost of removal of deferrals, installation and maintenance of ATG on approximately seven percent of systems, installation and maintenance of SIR on 60 percent of systems, and performing operability testing on all EGT systems. See Appendix D for details. O&M costs for emergency generator tanks are lower in Alternative 2 because operability testing is performed every 3 years versus every year under other options.

[d] Operations and maintenance costs associated with the adjustment of release detection leak rate probabilities is negative because operators avoid costly testing related to false alarms. These avoided costs are the only items included in the O&M for this requirement.

[e] Airport hydrant fuel distribution systems include a capital cost because tanks associated with airport hydrant fuel distribution systems without existing ATGs are assumed to install ATGs to comply with the requirement. UST systems with field-constructed tanks without existing ATGs are assumed to conduct annual precision tightness tests to comply with the requirement. See Appendix A for details.

[f] Although the closure of lined tanks represents a capital cost, we consider it an operations and maintenance cost as a modeling convenience. See Appendix D for details.

[g] Total may not add correctly due to rounding.

[h] As a simplifying assumption, EPA assumes that UST systems enter and exit the universe at a constant annual rate, such that the total number of UST systems in the universe does not change. We assume that operations and maintenance costs associated with these systems offset each other, as the number of entries equals the number of exits; however, new systems entering the universe will still incur incremental capital costs associated with certain requirements (e.g., a new emergency generator tank would need to install a release detection method). For modeling purposes, we account for these new units in the "Additions for new units." The costs shown reflect the capital costs associated with new units for all but the following requirements: elimination of flow restrictors for new tanks, requirement of secondary containment for new tanks, and requirement of under-dispenser containment for new dispenser systems.

[i] Cost estimates were derived using a seven percent discount rate.

Exhibit 3-4

Discounted And Annualized Cost Per System Affected By Requirement[g]

Description[a]	Preferred Option		Alternative 1		Alternative 2	
	Cost per System [f]	Systems Affected	Cost per System [f]	Systems Affected	Cost per System [f]	Systems Affected
Release Prevention						
Walkthrough inspections	$104	440,817	$104	440,817	$37	387,724
Periodic testing of: [b] - Overfill prevention equipment - Spill prevention equipment [c] - Interstitial integrity	$299	290,891	$681	335,750	$180	432,682
Testing after repairs to spill and overfill prevention equipment, and interstices [d]	$164	82,276	$106	82,276	$164	82,276
Eliminate flow restrictors in vent lines for all new tanks and when overfill devices are replaced	$37	32,460	$37	32,460	$0	32,460
Release Detection						
Operability tests for release detection methods [b]	$121	176,934	$121	176,934	$52	152,915
Eliminate groundwater and vapor monitoring as release detection methods	$63	31,612	$74	31,612	$0	31,612
Add SIR/CITLD to regulations with performance criteria	$1	2,882	$1	2,882	$1	2,882
Remove deferral for emergency generator tanks [e]	$188	11,704	$188	11,704	$181	11,704
Change release detection leak rate probabilities [b]	N/A	N/A	$251	197,532	N/A	N/A
Response to interstitial monitoring alarms	$78	10,569	$78	10,569	$78	10,569
Other						
Remove deferral from airport hydrant fuel distribution systems	$188,545	97	$1,193,506	97	N/A	N/A
Remove deferral from UST systems with field-constructed tanks	$45,344	102	$327,861	102	N/A	N/A
Require notification of ownership change	$5	8,946	$5	8,946	$5	8,946
Closure of lined tanks that cannot be repaired according to a code of practice	$35,499	59	$35,499	59	$35,499	59
Requirements for determining compatibility	$2	611,449	$2	611,449	$2	611,449
EPAct-related Provisions						
Operator training	$54	2,625	$54	2,625	$54	2,625
Secondary containment	$415	2,224	$415	2,224	$415	2,224

[a] Requirements that apply at the facility level are converted to a system basis using a conversion factor of 2.74 systems per facility.

[b] Because the number of systems affected varies depending on the individual testing requirements, we estimate the number of systems affected by all three requirements by dividing their total cost by the sum of their unit costs. For example, if the three requirements had total unit costs of $100 and created new costs of $100,000, we would estimate that they affect 1,000 systems.

[c] Alternative 1 calls for spill prevention equipment replacement every three years. For analytical convenience, we annualize the cost of replacement over three years and incorporate it as an O&M cost.

[d] Costs fall under Alternative 1 compared with the Preferred Option because replacement of spill prevention equipment every 36 months will eliminate the need for repairs to such equipment.

[e] Costs related to removal of deferrals for the regulation of emergency generator tanks include the cost of removal of deferrals, installation and maintenance of ATG on approximately seven percent of systems, installation and maintenance of SIR on 60 percent of systems, and performing operability testing on all EGT systems. See Appendix D for details. Costs for emergency generator tanks are lower in Alternative 2 because operability testing is performed every 3 years versus every year under other options.

[f] It is important to note that these unit costs cannot be summed to obtain a total cost per system because nearly all systems are already in compliance with some requirements of the proposed rule.

[g] Cost estimates were derived using a seven percent discount rate.

3.4.1 Assessment of Compliance Costs under the Alternative Baseline Scenario

Exhibit 3-5 presents total annual compliance costs of the proposed rule under the alternative baseline discussed in Section 3.3.1. Annual compliance costs are slightly less than those presented in **Exhibit 3-2**, reflecting the fact that the cumulative universe of affected systems in the alternative baseline is only marginally smaller than the universe in the original baseline.

Exhibit 3-5

Total Annual Compliance Costs Of The Proposed Rule Using an Alternative Baseline For UST Systems Affected[d]

Option	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Conventional UST systems [a]	$170	$350	$110
Emergency Generator Tanks (EGTs) [b]	$2.2	$2.2	$2.1
Airport Hydrant Fuel Distribution Systems (AHFDSs)	$18	$120	$0.0
UST systems with Field-Constructed Tanks (FCTs)	$4.6	$33	$0.0
Total[c]	**$200**	**$500**	**$120**

[a] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[b] Costs for EGTs are lower in Alternative 2 because operability testing is performed every 3 years versus every year under other options.
[c] Totals may not add exactly due to rounding.
[d] Cost estimates were derived using a seven percent discount rate.

3.5 Sensitivity Analyses

Certain aspects of EPA's compliance cost estimates are characterized by significant uncertainty and are sufficiently large that deviations from chosen assumptions may have a measurable impact on cost estimates. In this section, the analysis evaluates the sensitivity of certain results to variation in key parameters. These sensitivity analyses include evaluations of:

- Total compliance costs to the proposed rule under an alternative estimate of labor costs. Specifically, the analysis evaluates the effect of using higher labor rates, overhead costs, and fringe benefits factors, and lower average labor costs.

- Highest and lowest compliance cost scenarios for the distribution of technologies tested for overfill prevention equipment operability, tightness of spill prevention equipment, and interstitial integrity. If facilities using these technologies are disproportionately located in states that do not already have similar regulations in place, costs could be higher than estimates presented in the earlier parts of this chapter. Similarly, if affected facilities are located in states that already have similar regulations in place, costs could be substantially lower than estimated.

- High-end and low-end estimates of possible compliance costs for interstitial integrity testing. EPA's estimate of costs associated with interstitial integrity testing assumes a certain distribution of technologies, each of which carries a different testing cost. Variation in this distribution of technologies among facilities can significantly affect the estimates of compliance costs associated with interstitial integrity testing.

3.5.1. Compliance Costs of the Proposed Rule Using Alternative Estimates of Labor Rates, Overhead Costs, and Fringe Benefits

For conventional UST facilities, EPA has selected labor, overhead, and fringe benefits rates that best reflect a "typical" UST facility. These labor rates are representative of skilled labor costs at motor fuel retailers, which own and operate roughly 80 percent of the universe of UST systems. The use of these rates has a material impact on the estimated compliance cost of the proposed rule because they drive the operations and maintenance costs associated with requirements for walkthrough inspections and operability tests.

To evaluate the impact of alternative labor rates on total compliance cost estimates, EPA considered two alternative scenarios. The first is consistent with the OUST Information Collection Request 1360.08 and reflects labor rates reflective of economy-wide average wages, benefits, and overhead. This represents a high-end estimate because it reflects industries with highly skilled labor requirements and benefits (e.g., law firms).[1] The second uses specific labor categories and costs representative of retail motor fuel establishments, but assumes that lower-level staff may complete walkthrough inspections.[2]

Exhibit 3-6 presents the results for the three labor category scenarios. While one-time costs are not affected by the change in labor rates, operations and maintenance costs in the high-cost scenario are roughly $100 million higher than EPA's primary estimate, totaling $300 million rather than $200 million (an increase of 50 percent). The majority of this increase is due to higher operations and maintenance costs related to walkthrough inspections and operability tests. In contrast, the low-end labor-rate cost estimate totals approximately $180 million, roughly $20 million (or 10 percent) lower than EPA's central estimate. In addition to lower benefits and labor rates, this estimate assumes that clerical-level personnel will perform walkthrough inspections. This is consistent with remarks by UST experts, who indicated these tasks were most likely to be completed by non-technical workers. For AHFDSs and systems with FCTs, EPA uses constant industry average labor rates across all scenarios.

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[1] These labor categories were reported in OUST Information Collection Request 1360.08, dated October 24, 2007. We used revised labor rates from those categories to reflect 2009 conditions. However, documentation in this analysis did not provide a reason for the use of economy-wide average labor rates, and our assessment of the universe suggests that retail-based rates are more appropriate.

[2] Engineering experts consulted for this analysis suggest that walkthrough inspections are most likely to be performed by gas station clerks or service attendants, not technical personnel.

Exhibit 3-6

Compliance Cost Sensitivity Analysis: Alternative Labor Rates[i]

Description	Proposed Rule		
	Lower Estimate ($ thousands) [a]	**Primary Estimate used for Analysis ($ thousands)** [b]	**Upper Estimate ($ thousands)** [c]
Release Prevention			
Walkthrough inspections [d]	$23,000	$46,000	$120,000
Periodic testing of: - Overfill prevention equipment - Spill prevention equipment - Interstitial integrity	$87,000	$87,000	$87,000
Testing after repairs to spill and overfill prevention equipment, and interstices	$13,000	$13,000	$14,000
Elimination of flow restrictors in vent lines for all new tanks and when overfill devices are replaced	$1,200	$1,200	$1,200
Subtotal - Release Prevention	**$124,200**	**$147,200**	**$222,200**
Release Detection			
Operability tests for release detection methods	$20,000	$21,000	$42,000
Eliminate groundwater and vapor monitoring as release detection methods [e]	$2,100	$2,000	$270
Add SIR/CITLD to regulations with performance criteria	$3	$3	$3
Remove deferral for emergency generator tanks	$2,100	$2,200	$3,200
Change release detection leak rate probabilities	$0	$0	$0
Response to interstitial monitoring alarms	$830	$830	$830
Subtotal - Release Detection	**$25,033**	**$26,033**	**$46,303**
Other			
Remove deferral for airport hydrant fuel distribution systems [f]	$18,000	$18,000	$18,000
Remove deferral for UST systems with field-constructed tanks [f]	$4,600	$4,600	$4,600
Require notification of ownership change	$19	$42	$74
Closure of lined tanks that cannot be repaired according to a code of practice	$2,100	$2,100	$2,100
Requirements for determining compatibility	$910	$1,200	$2,500
Subtotal – Other	**$25,629**	**$25,942**	**$27,274**
EPAct-related Provisions			
Operator training	$130	$140	$230
Secondary containment	$920	$920	$920
Subtotal - EPAct-related Provisions	**$1,050**	**$1,060**	**$1,150**
Subtotal [g]	**$180,000**	**$200,000**	**$300,000**
Additions for new units (beyond those included above) [h]	$5	$5	$5
Total [g]	**$180,000**	**$200,000**	**$300,000**

Exhibit 3-6

Compliance Cost Sensitivity Analysis: Alternative Labor Rates[i]			
	Proposed Rule		
Description	**Lower Estimate ($ thousands) [a]**	**Primary Estimate used for Analysis ($ thousands) [b]**	**Upper Estimate ($ thousands) [c]**

[a] Lower Estimate relies on BLS Industry-Specific Occupational Employment and Wages, NAICS 447000 - Gasoline Stations, May 2008 for: Managerial (41-1011 First-Line Supervisors/Managers of Retail Sales Workers): Technical (53-1021 First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand); Clerical (53-6031 Service Station Attendants); and BLS National Occupational Employment and Wages, May 2008 for Technical for operability testing (49-2094 Electrical and Electronics Repairers, Commercial and Industrial Equipment) and Legal (23-1011 Lawyers). Benefits rate is 24.6 percent of wages, as reported in BLS Employer Costs for Employee Compensation, September 2008. Table 10: Trade, transportation, and utilities - retail trade. Overhead rate is 12 percent from OMB Circular A-76, p. D-7. Assumes that service station attendants perform walkthrough inspections, consistent with information from experts consulted for this analysis.

[b] Primary Estimate relies on BLS Industry-Specific Occupational Employment and Wages, NAICS 447000 - Gasoline Stations, May 2008 for: Managerial (11-0000 Management Occupations (Major Group)); Technical (53-1021 First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand); and Clerical (43-9061 Office Clerks, General); and BLS National Occupational Employment and Wages, May 2008 for Technical for operability testing (49-2094 Electrical and Electronics Repairers, Commercial and Industrial Equipment) and Legal (23-1011 Lawyers). Benefits rate is 28.3 percent (BLS Employer Costs for Employee Compensation, September 2009. Table 10: All workers, service-providing industries). Overhead rate is 12 percent from OMB Circular A-76, p. D-7.

[c] Upper Estimate relies BLS Employer Costs For Employee Compensation, September 2008 for Managerial (Table 9, Management, Professional, and Related); Technical and Technical for operability testing (Table 10, Professional and Technical Services (Service Industries)); and Clerical (Table 11, Office and Administrative Support); and BLS National Occupational Employment and Wages, May 2008 for Legal (23-1011 Lawyers). Overhead rate used is 67 percent from OUST Information Collection Request 1360.08 from October 24, 2007.

[d] Walkthrough inspections under the Lower Estimate rely on clerical labor rates estimated using BLS Standard Occupational Code 53-6031, Service Station Attendants; under other scenarios, we use technical labor rates estimated using BLS Standard Occupational Code 53-1021, First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand. UST experts consulted for this analysis suggest that walkthrough inspections are most likely to be performed by gas station clerks or service attendants, not technical personnel (e.g. 3rd-party contractors).

[e] Baseline activities for operators of tanks that use groundwater or vapor monitoring include activities such as recording of monthly measurements, which rely on technical labor. By eliminating groundwater and vapor monitoring as release detection methods under the proposed rule, these activities will no longer be required. As a result, increasing labor rates reduces the incremental costs of the proposed rule.

[f] The labor rate used for these types of system is the latest ICR labor rate, except for a component of the Operator Training requirement, which uses the United States Air Force labor rate for pay grade E-6 over 3.

[g] Totals may not add exactly due to rounding.

[h] As a simplifying assumption, EPA assumes that UST systems enter and exit the universe at a constant annual rate, such that the total number of UST systems in the universe does not change. We assume that operations and maintenance costs associated with these systems offset each other, as the number of entries equals the number of exits; however, new systems entering the universe will still incur incremental capital costs associated with certain requirements (e.g., a new emergency generator tank would need to install a release detection method). For modeling purposes, we account for these new units in the “Additions for new units.” The costs shown reflect the capital costs associated with new units for all but the following requirements: elimination of flow restrictors for new tanks, requirement of secondary containment for new tanks, and requirement of under-dispenser containment for new dispenser systems.

[i] Cost estimates were derived using a seven percent discount rate.

3.5.2 Sensitivity Analysis of Distribution of Technologies Tested for Overfill Operability, Spill Prevention Equipment Tightness, and Interstitial Integrity

Because data on the distribution of UST technologies (including release detection and prevention technologies) is available only at a national level, EPA is not able to identify how facilities and systems with certain technologies are distributed across different states. As a result, the cost analysis assumes that technologies are distributed uniformly across all states and territories. For systems that require testing for overfill operability, spill prevention equipment tightness, and interstitial integrity, actual compliance costs may differ substantially from EPA's estimates if this assumption does not hold. For example, if facilities using these technologies are disproportionately located in states that do not already have similar testing requirements in place in the baseline, compliance costs could be higher than the estimates based on a uniform distribution presented in **Exhibit 3-2** and **Exhibit 3-3**. Similarly, if affected facilities are concentrated in states that already have similar regulations in place in the baseline, then actual compliance costs could be substantially lower than estimates based on a uniform distribution.

To investigate the impact of the assumption of uniform distribution of technologies, EPA performed a bounding analysis of the two extreme cases of distribution. **Exhibit 3-7** reports the possible range of values for scenarios where compliance cost is the lowest (i.e., facilities are located in states that already satisfy the proposed rule), the actual model scenario based on uniform distribution, and the scenario in which compliance costs are highest. Variation between the minimum and maximum cost scenarios totals approximately $21 million, or eleven percent of the total compliance costs estimated for the rule. EPA's primary estimate of these costs is near the mid-point of the range of estimates.

Exhibit 3-7

Discounted Highest And Lowest Compliance Cost Scenarios For Technologies Tested For Overfill Operability, Spill Prevention Equipment Tightness, And Interstitial Integrity[b]

Regulatory change	Lower ($ millions)	Primary ($ millions)	Upper ($ millions)
Overfill operability testing[a]	$23	$23	$23
Spill prevention equipment testing	$54	$55	$62
Interstitial integrity testing	$0	$9	$13
Total	**$77**	**$87**	**$98**

[a] Because the entire universe of systems will be required to test overfill operability, EPA does not expect any uncertainty related to the locations of affected systems.
[b] Cost estimates were derived using a seven percent discount rate.

3.5.3 Sensitivity Analysis of Compliance Costs for Interstitial Integrity Testing

EPA's estimates of compliance costs associated with interstitial integrity tests are weighted to exclude tanks and piping that are continuously monitored using vacuum, pressure, or liquid-filled methods.[3] In addition, tanks using continuous interstitial monitoring sensors are excluded. For the purpose of this analysis, EPA assumes that five percent of tanks and 90 percent of piping with interstices will require such testing.[4] Costs may vary to the extent that the actual number of facilities with these types of equipment differs from these estimates.

To establish a range of possible values, EPA investigated the scenarios outlined in **Exhibit 3-8**. For relatively large changes in EPA's choices of parameters for universe affected, total costs for this proposed change vary between $5 million and $12 million. This uncertainty of $7 million represents four percent of the total estimated compliance costs of the rule.

Exhibit 3-8

Sensitivity Analysis Of Interstitial Integrity Testing Universe

Estimate		**Universe Affected**	**Discounted Cost ($ millions)**
Lower	Tanks	5%	$5
	Piping	50%	
Primary	Tanks	5%	$9
	Piping	90%	
Upper	Tanks	50%	$12
	Piping	95%	

Note: Cost estimates were derived using a seven percent discount rate.

3.5.4 Summary of Sensitivity Findings

EPA's sensitivity findings suggest that possible variation in labor rates is likely to produce the most significant impact on the estimated cost of the proposed rule: plausible selections for labor rates may reduce preferred option costs by approximately $20 million (10 percent) or increase them by $100 million (50 percent). Separately, EPA has identified potential variation of approximately eleven percent related to the distribution of technologies involved in overfill operability testing, integrity testing of interstitial areas, and spill prevention equipment tightness testing, and approximately four percent related to assumptions regarding interstitial

[3] Secondary containment areas include tank and piping interstitial areas as well as containment sumps used as part of the piping secondary containment or interstitial monitoring. Under the proposed rule, EPA will allow the following exceptions to interstitial integrity tests: (1) Tanks: Owners and operators using continuous interstitial monitoring on their tanks will not be required to perform periodic interstitial integrity tests; (2) Piping: Owners and operators using vacuum monitoring, pressure monitoring, or liquid-filled interstitial space monitoring on their underground piping will not be required to perform periodic interstitial integrity tests; and (3) Containment Sumps – Owners and operators using containment sumps which have two walls and continuously monitor the interstitial space between the walls for releases are not required to perform interstitial integrity tests.

[4] An interstitial integrity test is performed in the space between tank walls, pipe walls, or in a secondary containment sump area and ensures the area being tested has integrity and will contain a leak.

integrity testing. We note that each of these sensitivity analyses reflects variation compared with the primary estimates of costs presented throughout this chapter.

These analyses only illustrate the uncertainty surrounding certain elements of the proposed rule. The estimates presented in the body of this chapter represent reasonable, conservative central tendencies for the costs of the proposed rule.

3.6 Administrative Compliance Costs

In addition to compliance costs related to the operation of UST systems, the proposed rule will also impose certain administrative costs on affected entities. We outline these costs below.

3.6.1 State Government Administrative Compliance Costs

The proposed rule imposes new Underground Storage Tank program administration requirements on state government agencies.[5] Specifically, state government agencies will incur costs associated with new notification requirements, and costs associated with obtaining and reading the regulations. This section reviews state government costs associated with these activities.

Costs associated with obtaining and reading the regulations assume that 10 people will each take six hours to read the regulation in each state (using the legal labor rate for states of $47 per hour from OUST's ICR 1360.08). In addition, based on the ICR, we assume that the reporting and recordkeeping burden for states to apply for State Program Approval (SPA) is approximately 28.5 hours (using the clerical labor rate for states of $26 per hour). The total compliance cost in nominal terms is therefore approximately $205,000; the annualized compliance cost assuming the 20-year regulatory time horizon is approximately $19,000.[6] States that already require ownership change notifications will incur compliance costs associated with these activities.

State agencies that do not currently have a requirement for notification of changes in UST ownership or for at least an annual UST registration must also process a certain number of notices due to annual turnover in facility ownership. State government compliance costs for this activity assume a typical nominal recordkeeping cost of $30 per facility, based on OUST's ICR 1360.08; compliance costs assume the use of existing recordkeeping systems. Eight states and territories do not currently have recordkeeping requirements consistent with the proposed

[5] In some cases, UST systems are directly owned or operated by local, state, and federal government entities. These costs are subsumed in the estimates of compliance costs presented earlier in this chapter.

[6] Consistent with other parts of this regulatory impact analysis, we amortize one-time or capital costs over the regulatory time horizon of 20 years. If these costs are phased in over a three-year period, annual costs decrease to approximately $18,000.

regulation.[7] These eight states and territories will incur approximately $100,000 per year, due to an annual turnover rate of approximately 10 percent in UST facility ownership.

Lastly, each state agency will incur costs to process the one-time notifications of existence for EGTs, AHFDSs, and FCTs. State government compliance costs for this activity assume a typical nominal recordkeeping cost of $30 per facility, based on OUST's ICR 1360.08; compliance costs assume the use of existing recordkeeping systems. Based on the estimated universe of EGTs, AHFDSs, and FCTs, the total state processing cost in nominal terms is approximately $560,000; the annualized processing cost assuming the 20-year regulatory time horizon is approximately $53,000.

Total state government administrative compliance costs sum to $170,000 per year. Note that under alternative baseline assumptions, these costs would decline by a very small percentage (roughly 2 percent) as the universe of affected systems declines. These costs are reflected in **Exhibit 3-10**.

3.6.2 Costs to Regulated Universe to Review Regulations

This analysis assumes that all facility operators in the universe will be required to read the proposed rule in order to comply with it. For conventional USTs and EGTs, we estimate that reading and understanding the proposed rule will require 4.75 hours of labor from a manager at each facility. This equates to a one-time cost of approximately $244 for each facility, or $54 million. This is equivalent to an annual cost of $5.1 million under each proposed option. For FCTs and AHFDSs, we assume these costs are subsumed in the management costs for these systems (see Appendix A for details).

3.7 Summary – Total Annual Compliance Costs

In total, EPA estimates that the Preferred Option for the proposed rule will produce incremental costs of approximately $210 million per year compared to the current regulatory baseline. **Exhibit 3-9** summarizes these costs per category. Regardless of the option, conventional UST systems will incur over 65 percent of these costs. Costs to AHFDSs and FCTs comprise approximately 11 percent and 29 percent of total costs under the Preferred Option and Alternative 1, respectively.

[7] These states are Arizona, Georgia, Idaho, North Carolina, North Dakota, Nevada, and South Carolina. The Virgin Islands will also incur these costs.

Exhibit 3-9

Total Annual Compliance Costs[e,f]

Category	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Conventional UST systems[a]	$180	$360	$120
Emergency Generator Tanks (EGTs) [b]	$2.2	$2.2	$2.1
Airport Hydrant Fuels Distribution Systems (AHFDSs)	$18	$120	$0.0
UST systems with Field-Constructed Tanks (FCTs)	$4.6	$33	$0.0
Cost to Owners/Operators to Read Regulations	$5.1	$5.1	$5.1
State Government Administrative Costs [c]	$0.2	$0.2	$0.2
Total Annual Compliance Costs [d,f]	**$210**	**$520**	**$130**

[a] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[b] Costs for EGTs are lower in Alternative 2 because operability testing is performed every 3 years versus every year under other options.
[c] The costs for UST systems directly owned or operated by local, state, and federal government entities are included in the estimates of compliance costs within the other categories. Costs shown here reflect the administrative costs for state governments to read the regulations, apply for state program approval, process notifications of ownership changes, and process one-time notifications of EGT, AHFDS, and FCT existence.
[d] Totals may not add up due to rounding.
[e] Cost estimates were derived using a seven percent discount rate.
[f] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

Limitations of Compliance Cost Analysis

While EPA has taken steps to present a sound analysis of compliance costs, it recognizes that certain assumptions and limitations are inherent to this assessment.

Tank configuration: This analysis assumes that a particular configuration of equipment represents the average UST system. This assumption affects the compliance costs of the proposed rule because systems with different configurations (e.g., more sumps per tank) could have different costs. Mischaracterizing this configuration may under- or overstate total costs as well as system-level costs.

System-level compliance costs: As discussed in Section 3.3, system-level compliance costs are based on public information, input from UST industry professionals, and EPA professional judgment, all of which are assumed to provide the most accurate available data at the time of this proposal. EPA recognizes that these data sometimes reflect only a small number of sources, and are therefore characterized by uncertainty.

As a result of these uncertainties, the precise cost of the proposed rule may differ from the estimate generated by EPA's analysis. The above sensitivity analyses, though not strictly additive, suggest that the outside range of cost uncertainty is approximately 50 percent from EPA's central estimates. Moreover, because EPA's estimate is framed by a number of conservative assumptions (outlined in section 3.3), it is unlikely that this analysis understates the costs of the proposed rule significantly.

3.7.1 Summary – Total Annual Compliance Costs under the Alternative Baseline Scenario

Under the alternative baseline universe assumption described in Section 3.3.1, EPA estimates that the Preferred Option for the proposed rule will produce incremental costs of approximately $200 million per year compared to $210 million in annual costs in the primary analysis. **Exhibit 3-10** summarizes these costs per category. Regardless of the option, conventional UST systems will incur over 65 percent of these costs. Costs to AHFDSs and FCTs comprise approximately 11 percent and 30 percent of total costs under the Preferred Option and Alternative 1, respectively.

Exhibit 3-10

Total Annual Compliance Costs Using an Alternative Baseline[e,f]

Category	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
Conventional UST systems[a]	$170	$350	$110
Emergency Generator Tanks (EGTs) [b]	$2.2	$2.2	$2.1
Airport Hydrant Fuels Distribution Systems (AHFDSs)	$18	$120	$0.0
UST systems with Field-Constructed Tanks (FCTs)	$4.6	$33	$0.0
Cost to Owners/Operators to Read Regulations	$5.1	$5.1	$5.1
State Government Administrative Costs [c]	$0.2	$0.2	$0.2
Total Annual Compliance Costs [d]	**$200**	**$510**	**$120**

[a] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[b] Costs for EGTs are lower in Alternative 2 because operability testing is performed every 3 years versus every year under other options.
[c] The costs for UST systems directly owned or operated by local, state, and federal government entities are included in the estimates of compliance costs within the other categories. Costs shown here reflect the administrative costs for state governments to read the regulations, apply for state program approval, process notifications of ownership changes, and process one-time notifications of EGT, AHFDS, and FCT existence.
[d] Totals may not add up due to rounding.
[e] Cost estimates were derived using a seven percent discount rate.
[f] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

Chapter 4. Assessment of Benefits And Cost Savings

4.1 Introduction

The beneficial impacts of a regulatory change are typically measured in two ways: as "social benefits" that usually take the form of reduced environmental damage, reduced human health risk, and improvements in the value of environmental amenities. Benefits also include avoided costs associated with reduced need for cleanup and avoided costs of "averting behavior" (e.g., obtaining replacement water supplies). Ideally, social benefits reflect accurate measures of the total "willingness to pay" (WTP) of consumers to obtain improvements in environmental quality. In other cases, avoided costs (e.g., medical care) can be used to inform proxy estimates of WTP when direct estimates of WTP are unavailable. In the context of this rule, EPA examines social benefits and separately considers the avoided costs associated with reduced need for cleanup of releases because reliable WTP estimates for the value of an avoided cleanup are not available, and because avoided costs represent a real economic cost savings.

This chapter describes the approaches used to evaluate avoided remediation (cleanup) costs and other benefits. It first outlines several different methods attempted for measuring benefits and cost savings, and describes the final selected method (expert consultation) in detail. Next, it provides a description of monetized cost savings and other benefits, including avoided cleanup costs, avoided vapor damage cleanup estimates, avoided product loss, and the value of avoided cancer risk associated with anticipated reductions in releases and reductions in severity of releases. The chapter then presents a screening-level analysis of the quantity of groundwater potentially protected by the regulations. Finally, we provide a qualitative discussion of ecological and other human health benefits.

4.2 Investigation of Empirical Methods for Measuring Benefits and Cost Savings

The benefits and cost savings of the proposed rule result from the reduced incidence and size of releases that would occur due to the new requirements. EPA examined a number of ways to use quantitative, empirical data on release rates, inspection effectiveness, and program performance to estimate directly the changes in releases that could be expected under the proposed rule. This section describes the different data sources and methods considered, and the limitations of each.

4.2.1 Engineering Estimates and Literature

One approach to estimating the benefits of the proposed rule would be to develop an engineering model of the release rates associated with equipment and practices before and after the implementation of the rule requirements. However, this approach would address only a small number of the proposed rule components because most of the requirements are not focused on equipment modifications, but instead call for inspections, testing, and maintenance. These are requirements for changes in human behavior, and are not easily measured using equipment testing.

This suggests that EPA could best measure benefits empirically by examining studies of how changing frequencies in inspection and testing would lead to different leak rates. Therefore, EPA conducted a targeted literature review of engineering literature and studies of the effectiveness of testing and inspection programs. We were unable to identify any studies directly applicable to the proposed UST regulations, but we did identify EPA and published literature on the effects of better inspection and testing rates more generally. We summarize several key studies below.

- **California study of impact of secondary containment on UST system releases (2002):**[1] This study examined whether use of secondary containment throughout UST systems resulted in differences in release rates. The study's conclusions were hampered by a limited sample size, and authors note that releases from other parts of the systems may have affected results. The study did not find a significant relationship between secondary containment and release rates at sites, but did find that facility-level factors (e.g., improper installations) made it more likely than expected that all systems at a facility would either have or lack releases. While the study cannot be used to directly estimate the benefits associated with the proposed regulation, its conclusions suggest that regulations focusing on effective facility-level inspections may be well-targeted.

- **National Research Council study of effectiveness of state vehicle emissions inspection and maintenance programs (2001):**[2] This study reviewed four state programs and one city program aimed at reducing motor vehicle emissions by requiring inspections and maintenance. While the study did not address UST systems, the structure of vehicle inspection programs is similar to the proposed regulations in that both require owners/operators to undertake routine inspections and undertake maintenance as needed. The study found that the programs had a measureable impact on ambient air quality, but did not identify whether the differences were statistically significant.[3] While the results do not provide a quantitative basis for estimating the impacts of the proposed rule, the study suggests that mandatory inspection programs can reduce emissions.

- **Environmental Results Program (ERP) data:**[4] Data from several environmental results programs (ERPs) show a statistically significant

[1] Thomas M. Young and Randy D. Golding, *Underground Storage Tank Field-Based Research Project Report,* submitted to the California State Water Resources Control Board under contract to the University of California, Davis, May 31, 2002

[2] Committee on Vehicle Emission Inspection and Maintenance Programs, *Evaluating Vehicle Emissions Inspection and Maintenance Programs,* National Academy Press, 2001.

[3] The study also concluded that the programs had more modest impacts than those predicted by air quality modeling, but this finding is of limited relevance to the current regulation, since no ambient conditions modeling has been conducted.

[4] See: Vermont Department of Environmental Conservation, "Final Report – Environmental Results Project – Vermont: Underground Storage Tank Facilities," March 17, 2010; Rhode Island Department of Environmental Management, Underground Storage Tank Environmental Results Program, Final Report, Tables I-IV; U.S.

improvement in verified compliance as a result of a combination of self-certification, technical assistance, and inspections. While these programs do not isolate the impact of specific regulatory changes, the results are consistent with other findings that programs that rely in part on self-implemented inspections and reporting can reduce noncompliance.

In general, the literature does not address UST inspection programs directly, and does not provide quantitative results that can be used to estimate the impacts of the proposed rule. However, the literature does provide data that generally indicate that self-implementing inspection programs (with external validation) do have an impact on equipment maintenance, and generally lead to a reduction in environmental impacts. This suggests that some positive impact should be expected from the proposed rule.

4.2.2 Statistical Analysis of State Release Data

A different approach to a robust analysis of benefits would be to develop a database of State UST rules and reported release rates before and after the effective dates of rules similar to the proposed rule. With good quality data, one could combine these rules and reported release rates and isolate the marginal impacts of various components of the proposed rule. To collect detailed data at the facility level, however, would require visiting state UST programs individually and collecting detailed site inspection data from state case files and archives. Not only would such an effort be prohibitive in terms of available resources, but our current knowledge of the state programs suggests that variable inspection practices and changes in record-keeping practices over time may limit the ability of the exercise to provide robust results.

In the absence of site-specific data, however, we collected and examined data on state regulatory programs and reported releases from available aggregate sources. Specifically, we identified and evaluated data from the following sources:

- **Leak Autopsy Reports:** In 2004 and 2005, EPA released two draft "leak autopsy" studies ("the draft 23-state Autopsy Report" and a separate study examining the State of Florida). These studies examined the sources and extent of releases that occurred in systems that were compliant with the 1998 standards, and identifies the extent to which different baseline releases are associated with failures of equipment in different parts of the UST system (e.g., piping, overfill protection equipment).[5]

- **State Regulatory and Report Data**: State programs are required to report aggregated information to EPA on the number of active UST systems, the number of inspections, and the number of confirmed releases reported in each six-month

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Environmental Protection Agency, "Evaluation of Three Environmental Results Programs (ERPs)," August 31, 2009; and U.S. Environmental Protection Agency, "ERP States Produce Results," December 2007.

[5] U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "Evaluation of Releases from New and Upgraded Underground Storage Tank Systems – Peer Review Draft," U.S. EPA, August 2004, and U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "Petroleum Releases at Underground Storage Tank Facilities in Florida," draft, March 2005.

period.[6] In addition, EPA obtained information about state regulatory programs and the effective dates for state requirements that are similar to the requirements of the proposed rule.

Using the available data, EPA examined several different statistical approaches, focusing on regression analysis, to compile and examine a set of state-level data that included the number of UST systems in each state in a given year, the number of releases from UST systems in each year, the number of UST inspections conducted in each year, and the presence or absence of regulations designed to prevent releases.

Before conducting regression analysis on the data set of state USTs and releases, EPA first adjusted the data to account for a number of data quality concerns. A key data concern was the relationship between states with low-frequency inspections and states reporting small numbers of confirmed releases. To ensure that the reported UST releases accurately reflected most or all releases taking place, EPA developed an index that scored each state based on the frequency of inspections. States that reported inspection rates less frequent than every five years, and/or inconsistent inspection frequencies over time, were removed from the sample, based on the assumption that release data from those states may be less reliable due to less frequent third party verification (i.e., state inspection) of system operations. In other words, we assume that owners/operators may be less inclined to report releases or properly maintain their equipment if they are in a state where inspections occur infrequently or inconsistently.

In conducting the analysis, however, EPA identified several fundamental problems with available data that limit the value of a regression analysis approach. These include significant data availability and reliability issues related to the limited number of observations and programmatic changes among states that prevent the isolation of regulation-related impacts. Specifically:

- Consistent, accurate release data are not available. It is likely that measurement error exists in the recording of confirmed releases across states (the dependent variable) and that it is related in some systematic way to the regulatory structure of the state or other explanatory variables (as opposed to random reporting error) in the analysis. In addition, state inspections vary in timing and focus across states; this, in turn, affects the consistency of third-party verified compliance and release information. While EPA attempted to account for this by selecting only states with a high frequency of inspections for inclusion in the analysis, the interaction between inspection frequency and degree and effectiveness of regulation creates sample selection problems (i.e., states with higher release rates due to limited regulation may also be states that do not conduct frequent inspections and therefore have less reliable data).[7] Therefore, normal regression

[6] Data can be accessed at http://www.epa.gov/oust/cat/camarchv.htm.

[7] As noted above, the only reliable approach to identify the relationship between inspection frequency, compliance, and number of releases would require a large-scale data collection effort. In absence of this, we use inspection frequency as an indicator of reliable data.

properties do not hold, and results may be biased in ways that do not allow for a reliable interpretation.[8]

- Many regulations consistent with the proposed rule are currently in place in only a small number of states. EPA addressed limited variation in the presence of regulations by dropping several regulatory variables from the analysis, but the resulting lack of variation and the small number of observations make it likely that regulatory indicators will proxy for other relevant characteristics of that state.
- Study design is limited by available data. Ideally, an analysis of the effectiveness of UST leak prevention regulations would employ observations from a large number of states over a time period that includes years before and after regulations were in place. Such "panel" data would allow for identification of impacts temporally and spatially. Panel data would also allow for fixed-effects estimation, which controls for any unobserved characteristics of states that might affect release rates (such as soil pH or climate), independent of any effect of regulation. Available data superficially appear to be panel data, since they provide information on the number or rate of releases from different states in multiple time periods, along with information on the presence or absence of UST regulations by state. However, for many regulations it is unclear both when the regulation was first promulgated and when the effects of the regulation would be expected to be fully realized (e.g., through inspections).

As discussed in more detail in Appendix F, quantitative analysis of annual UST releases by state did not reveal a consistent measure of the potential impact of release prevention regulations. The data limitations noted above prevented the use of the preferred method of fixed effects estimation using panel data. In the absence of fixed-effects estimation, the analysis cannot reliably draw conclusions about the impacts of regulations on releases, independent of any unmeasured characteristics of states that could be affecting the number of releases in each state. In other words, in addition to data quality issues discussed above, the small number of states with specific UST release prevention regulations prevents identification of robust relationships between individual regulations and the number of releases per year.

However, through cross-sectional analysis, EPA was able to estimate that release rates in California and Florida – two states with mature UST regulation regimes – were about 55-65 percent less than one would expect based on release rates at other states during the time period examined. This difference could serve as an upper bound for the potential of leak prevention regulations to reduce the rate of UST releases.[9]

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[8] For example, several regressions found an apparent *positive*, statistically significant relationship between secondary containment requirements and the number of releases per year. However, empirical data from Florida indicate that secondary containment contributes to release reductions of as much as 50 percent.

[9] Exhibit 6 in Appendix F shows the degree to which the actual number of releases in Florida and California in 2009, 2005, and from 2002 to 2006 is less than the number of releases that would be expected based on the release rates observed at other states. In 2005 and 2009, the years in which the dummy variable for California was statistically significant from zero, California had between 56 and 63 percent fewer releases than would be expected based on the regression analysis. In 2002-2006, when the period in which the dummy variable for Florida was statistically significant from zero, Florida had between 60 and 65 percent fewer releases than would be expected. EPA strongly cautions against generalizing these results beyond the states included in the analysis. However, these

4.3 Final Methodology for Assessment of Positive Impacts: Expert Consultation

To estimate the individual effects of each proposed regulatory change, and in light of the absence of applicable engineering models and limited empirical state data, we resorted to a consultation with five experts with experience in regulation of USTs and implementation of state inspection programs. The remainder of this chapter describes in detail the final methodology used to identify reductions in releases associated with the proposed rule, and the calculation of cost savings associated with those avoided releases.

To ensure that the assessment of regulatory effects relied on broad expertise in regulatory implementation, EPA developed a pool of technical experts with national reputations for leadership in implementation of underground storage tank regulatory programs, or with extensive expertise in assessing spill causation at UST sites. From this pool, several experts were interviewed and five experts were identified. Each of the identified experts has over 20 years of experience in the regulation, assessment, and/or remediation of underground storage tanks, including direction of state programs and implementation of regulations similar to some aspects of the proposed regulation.

EPA provided an identical set of written questions separately to each expert and conducted individual follow-up telephone interviews to clarify and verify responses. Appendix G provides a detailed explanation of the process EPA followed in identifying experts, more detailed information about the qualifications of the experts, and an explanation of the factors EPA considered when including and excluding expert feedback. Appendix H provides the questions distributed to experts and their responses.

One of the five experts did not provide input consistent with EPA's analytical methods, and as a result his quantitative estimates were not usable. Specifically, his baseline estimate of releases was not consistent with EPA's, and he was not able to provide information on how to extrapolate to EPA's universe. In addition, his responses included apparent internal inconsistencies that could not be reconciled without collecting more information about baseline releases.[10] We therefore believe the opinions of the remaining four experts provide the best available data on the expected impact of the proposed rule.

Avoided Costs as a Measure of Beneficial Impacts

Avoided remediation costs provide the basis for a substantial portion of the beneficial impacts associated with the proposed rule. Avoided remediation costs represent cost savings that accrue to owners, operators and public entities charged with remediating releases at regulated facilities.[11] While avoided remediation costs are not a direct measure of total willingness to pay

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numbers do suggest an upper bound of potential avoided leaks associated with the operation of the mature, relatively stringent programs in both California and Florida.

[10] The expert also provided clear opinions about the optimal regulatory structure and suggested that his answers were not reliable unless the regulatory language was amended to include specific technical requirements. This created additional uncertainty in the interpretation of his results.

[11] Chapter 5 provides a more detailed discussion on the potential positive effect of the proposed rule on state financial assurance funds.

for environmental improvements, and are therefore not equivalent to social benefits, they represent real economic cost savings due to reduced demand for baseline remediation.[12]

Calculation of Annual Positive Impacts

The analysis presents the positive effects of the proposed rule as a constant, recurring, annual value for analytical convenience. The timing of the positive impacts of the rule is uncertain for several reasons:

- As shown in **Exhibit 1-2** in Chapter 1, the proposed changes do not take effect simultaneously.
- Irrespective of when they take effect, the changes may require varying lengths of time to achieve full effect.
- EPA relies on its reported confirmed releases to calculate the reductions due to the proposed rule. Confirmed releases recorded in a particular evaluation year vary significantly in severity and length of time undetected, which introduces variability in the extent to which costs are avoided each year.
- The proposed rule includes activities such as: frequent inspections and equipment testing to prevent, identify and address releases; near-term shifts in technology; and long-term changes in technology. Each class of changes necessarily focuses on release avoidance and mitigation over different time horizons.

In the absence of detailed data characterizing releases by age and type, EPA assumes that implementation of the proposed regulations will have a uniform annual impact, with beneficial impacts realized on the last day of the year in which costs are incurred (i.e., a one-year delay). For equipment that is phased in over a period of time, we assume that positive impacts accrue at the same rate as installation and adjust those impacts so that they are constant over time.[13]

4.3.1 Avoided Remediation Costs

This section explains how EPA arrives at its estimates of avoided remediation costs.[14] EPA first explains how it calculates avoided remediation costs based on the source of a release. This is followed by a discussion of the methods used to calculate the number of releases avoided and the number of releases for which severity is mitigated. Finally, the two elements are combined to estimate the total avoided remediation cost due to the proposed rule.

[12] Economists commonly define social benefits as the sum of individuals' willingness to pay to obtain a good or service or avoid an unwanted outcome. Avoided remediation costs may not equal willingness to pay.

[13] See Appendix I for detailed explanation of this methodology.

[14] We refer to avoided cleanup costs and avoided remediation costs interchangeably throughout this document.

4.3.2 Calculating Avoided Remediation Costs

This analysis values avoided releases according to their cost of remediation. EPA developed average remediation costs for the four general release size categories reported in the draft 23-state Autopsy Report. The four categories generally conform with classification conventions used by state LUST offices, and the autopsy reports presented leak frequency data for different UST system components for each of the categories. The four categories include:

- Local site extent with soil contamination;
- Local site extent with water contamination;[15]
- Large site extent with soil contamination; and
- Large site extent with water contamination.[16]

EPA obtained remediation costs aligned with each of these size categories from a survey of state LUST offices and calculated average expected remediation costs for each of the release categories outlined in the draft 23-state Autopsy Report (**Exhibit 4-1**).[17] Remediation costs associated with groundwater remediation are generally higher than costs for soil remediation. Administrative, response, and oversight costs were provided by New Hampshire, and remediation costs reflect an average of the costs provided by New Hampshire and Utah.[18,19]

[15] Water contamination refers to both groundwater and surface water contamination, though groundwater contamination is more common than surface water contamination.

[16] While no specific definition exists for a large site, the LUST Autopsy survey instruments used by the states generally define large sites as those with contamination that extends beyond the extent of construction excavation. In addition, EPA classified sites with off-site contamination as large sites.

[17] U.S. Environmental Protection Agency Office of Underground Storage Tanks, "Evaluation of Releases from New and Upgraded Underground Storage Tank Systems," draft, August 2004.

[18] To develop an avoided cleanup cost estimate, EPA collected data from Montana, New Hampshire, New Mexico, South Carolina, Utah, and Virginia, all of which use state financial assurance funds to pay for LUST remediation. Each state UST program office received a questionnaire requesting data on typical cleanup costs broken out by the four general release types; New Hampshire, New Mexico, South Carolina, Utah and Virginia provided responses. New Hampshire provided the most comprehensive set of information., including cleanup costs by category (i.e., administrative, response, remediation, and oversight), while New Mexico and Utah could only provide estimates of remediation costs. Virginia and South Carolina were unable to provide the detail required for this analysis, as neither state was able to break out costs by the extent of release (i.e., large or small).

[19] New Mexico data are excluded from the calculation for two reasons. First, large-extent groundwater cleanup cost estimates from New Mexico are much higher than those for other states ($2.5 million compared with $0.6 million or less for other states) but the state did not provide data on the number or type of sites that resulted in this high estimate of costs. Second, New Mexico has a relatively small number of UST systems (3,958 UST systems as of September 30, 2009). As a result, we believe that New Mexico may be atypical and could skew results to overstate avoided costs. We therefore do not include its results among the average avoided costs of remediation.

Exhibit 4-1 [a]

Remediation Costs By Release Extent

Remediation Cost Category	Site Size And Contamination Type			
	Small extent, soil only	**Large extent, soil only**	**Small extent, Groundwater Contamination**	**Large extent, Groundwater Contamination**
Typical administrative cost (public notification, fines, fees, etc)[b]	$0	$0	$500	$3,700
Typical response cost (e.g., alerting and sending personnel, assessments and planning, immediate actions to stop the release)[b]	$10,000	$10,000	$10,000	$10,000
Typical remediation cost[c]	$14,800	$103,000	$98,500	$409,500
Typical oversight cost (e.g., monitoring)[b]	$500	$1,000	$1,500	$5,000
Total typical cost per LUST category	**$25,300**	**$114,000**	**$110,500**	**$428,200**

Notes:

[a] Costs shown are one-time costs associated with a site remediation and have been rounded to the nearest hundred dollars.

[b] The costs presented for administrative, response, and oversight costs are based on New Hampshire data only.

[c] The remediation costs shown represent the average costs from data provided by New Hampshire and Utah. Although New Mexico also reported costs, we excluded it for two reasons. First, groundwater cleanup cost estimates from New Mexico are much higher than those for other states ($2.5 million compared with $0.6 million or less for other states) but the state did not provide data on the number or type of sites that resulted in this high estimate of costs. Second, New Mexico has a relatively small number of UST systems (3,958 UST systems as of September 30, 2009). As a result, New Mexico’s costs may be atypical and could skew results to overstate avoided costs.

Sources:

1. New Hampshire Department of Environmental Services, Underground Storage Tank Program, November 18, 2008.
2. Utah Department of Environmental Quality, Underground Storage Tank Program, November 18, 2008.

EPA then used the average cost data from states to develop weighted average costs associated with remediation of releases from different portions of the UST system, based on release frequency data for each source. **Exhibit 4-2** presents, for each of the release sources identified in the draft 23-state Autopsy Report, the probability of a release by LUST category.[20] Using the cost data from **Exhibit 4-1**, EPA estimates a weighted average avoided cost per release size by multiplying the cost per site by the probability of each release type. These are summed across the categories to obtain the weighted average cost by release source.[21, 22]

[20] Office of Underground Storage Tanks, “Evaluation of Releases from New and Upgraded Underground Storage Tank Systems – Peer Review Draft,” U.S. EPA, August 2004. Note that these sources include California and Florida releases, and may therefore be skewed slightly if those more stringent and established programs have smaller releases. We are unable to adjust the data to correct for this, but its impact, if any, would likely be to reduce the average size and cost of releases slightly.

[21] For more information on this approach and the draft 23-state Autopsy report, see “Methodology to Estimate Avoided Costs Associated with a Typical UST Leak,” IEc Memorandum to EPA, prepared by Aaron Kamholtz, Neal Etre, and Cynthia Manson, October 27, 2008.

[22] If we calculate a weighted-average cost per release where sources are weighted proportionally by their contribution to total releases, we obtain an overall average cost per release of approximately $143,000 (See memo in Appendix I for details). For reference, ASTSWMO estimates the average cost per site to be roughly $127,000 in 2009. See Association of State and Territorial Solid Waste Management Officials, State Fund Survey Results 2009.

Exhibit 4-2

Probability And Weighted Average Of Avoided Costs Per Release Source And Extent

Release Source (as identified in 23-state Autopsy Report)		**Small extent, soil only**	**Large extent, soil only**	**Small extent, groundwater contamination**	**Large extent, groundwater contamination**	**Total/ Weighted Average**
Piping	Probability	40.50%	22.00%	4.50%	33.00%	100.00%
	Cost	$10,200	$24,300	$5,100	$141,300	$181,000
Dispenser	Probability	71.60%	9.70%	5.40%	13.30%	100.00%
	Cost	$18,100	$10,700	$6,100	$57,100	$92,000
Tank	Probability	30.70%	17.70%	17.30%	34.30%	100.00%
	Cost	$7,800	$19,500	$19,700	$147,000	$194,000
STP Area	Probability	50.00%	31.00%	0.00%	19.00%	100.00%
	Cost	$12,600	$34,300	$0	$81,400	$128,200
Delivery Problems	Probability	59.20%	16.80%	1.80%	22.20%	100.00%
	Cost	$14,900	$18,500	$2,100	$95,200	$130,700

Note: Costs shown have been rounded to the nearest hundredth dollar.
Sources:
1. U.S. EPA, *Evaluation of Releases from New and Upgraded Underground Storage Tanks* (Draft). 2004. ("23-state Autopsy Report")
2. New Hampshire Department of Environmental Services, Underground Storage Tank Program, November 18, 2008.
3. Utah Department of Environmental Quality, Underground Storage Tank Program, November 18, 2008.

4.4 Establishing Avoided Releases

To estimate the number of baseline releases that would be either avoided completely or reduced in severity as a result of the proposed rule, experts responded to a common set of questions about potential impacts of the regulatory changes under consideration and participated in follow-on discussions on specific areas of uncertainty.

Each expert reviewed the proposed requirements and estimated how they would affect the following dimensions of releases: [23]

1. Changes in total frequency (number) of annual confirmed releases;
2. Changes in the number of remaining releases that reach groundwater;
3. Changes in the average quantity released among remaining releases; and,
4. Changes in the average duration of release among remaining releases.

Experts had the option of expressing reductions in release size in terms of duration or volume (quantity) of product, depending on how they typically collected and reviewed release data. In addition, experts were given the option of expressing these changes either: 1) as a total

[23] EPA did not provide experts with information about the universe of facilities or costs associated with remediation; experts did, however, have access to information about the number of confirmed releases and their distribution across different parts of the UST system (e.g., tanks, pipes, and STP areas). EPA uses confirmed releases as the baseline estimate of total releases because high quality data on total releases are not available, and release confirmation triggers the remediation costs that would be avoided.

national estimate that accounted for variation in existing regulation and technology among states and facilities, or 2) as a change applied to a specific subset of the tank universe (e.g., 10 percent change among tanks with a certain technology that are not currently regulated).

Experts also estimated the sensitivity of results to changes in the frequency of regulatory requirements (e.g., the impact of inspections occurring at different intervals, consistent with different regulatory options) and noted synergies or dependencies between requirements, such as:

- Dependency between equipment upgrades and walkthrough inspections: Experts consistently noted that simply replacing equipment with newer technologies (e.g., requiring that new systems have secondary containment) is insufficient for preventing all releases. Regular visual inspections are necessary to identify potential problems and ensure timely maintenance when a release has not yet occurred.

- Synergy between equipment maintenance and walkthrough inspections: Experts noted that the combination of operability testing and visual (walkthrough) inspections would result in more avoided releases by identifying equipment problems quickly and ensuring effective maintenance.

- Dependency between operator training and walkthrough inspections: Experts noted that training alone is not adequate to ensure effective site maintenance, and walkthrough inspection requirements are not effective without trained staff. As a result, all experts assumed that impacts related to walkthrough inspections reflected trained staff and did not separately identify release reductions associated with training.

Experts provided separate estimates of impacts for each regulatory requirement. EPA then used these requirement-specific estimates to calculate total avoided costs for the proposed rule.[24] It is important to note, however, that when considering inter-relationships among regulatory requirements, experts differed in how they isolated and/or "allocated" impacts across specific requirements because the allocation of impacts across different regulatory requirements could potentially be interpreted in several ways (e.g., one expert might decide that inspections drove all impacts, while another might decide that testing was the primary factor). EPA

[24] Experts were also asked to provide an estimate of the "total cumulative impact" for the proposed rule in aggregate as well. The analysis then compared the effects of simultaneously applying the requirement specific estimates with their total estimate of the overall effect of the proposed rule. This was performed to verify the experts' logic and identify areas of overlap or synergy among the regulatory requirements. However, subsequent to receiving responses from experts, EPA made slight modifications to the list of regulatory requirements (e.g., experts were asked to consider impacts of an annual overfill prevention equipment test, but EPA is now proposing 3-year tests). While EPA was able to adjust the requirement specific estimate of these slight revisions based on the sensitivity responses from the experts and follow-up questioning, the original "total cumulative impact" estimates provided by the experts are no longer representative of the current proposed rule as a whole. We note, though, that the average of cumulative estimates was generally consistent with (i.e., within 10 percent of) the equivalent requirement-specific impacts.

therefore avoids emphasis on the requirement-specific estimates provided by each expert, and considers their results in total.[25,26]

In general, EPA applies the most conservative estimates presented by the experts and adjusts for the number of affected units where appropriate. In cases where reductions involved a range of values, EPA typically selected the low end of the range. Where experts' comments reflect qualitative assumptions that substantially affect their quantitative estimates, the analysis acknowledges those factors as caveats to estimated rates of release avoidance.

To calculate the number of releases completely avoided as a result of potential regulatory changes, EPA combines the estimated reductions as identified by experts with a release distribution based on data from the draft 23-state Autopsy Report (see Appendix I for more detail). To estimate changes in release severity, the analysis uses the distribution of releases from the same report to quantify the number of groundwater releases avoided due to reduced release volume. **Exhibit 4-3** provides a summary of our findings with respect to avoided releases. Experts' responses suggest that the Preferred Option of the proposed rule will avoid approximately 20 percent to 60 percent of 7,168 annual releases, or roughly 1,400 to 4,300 releases in evaluation year 2009. In addition,as summarized in **Exhibit 4-4**, of the remaining releases, approximately 330 to 1,100 releases would be reduced in severity (i.e., these releases would remain soil contamination only).).[27]

Exhibit 4-3

Avoided Releases

Expert	Preferred Option	Alternative 1	Alternative 2
Expert 1	1,400	2,100	610
Expert 2	1,400	1,500	420
Expert 3	1,800	2,000	1,400
Expert 4	4,300	4,600	3,300
Range	**1,400 – 4,300**	**1,500 – 4,600**	**420 – 3,300**

Note: See Appendices H and I for inputs and methods for calculating these values. Estimates were validated with experts to ensure they accurately capture their opinions. Specifically, Expert 4 verified that he believed the rule would result in avoidance of over half of confirmed releases.

[25] Note that EPA carefully examined and reviewed each requirement-specific estimate from each expert, and verified the results and assumptions with each expert, particularly in cases where results reflect a wide range.

[26] Consistent with the approach adopted for the cost analysis, EPA asked experts to estimate reductions in releases and release severity assuming that owners/operators would comply fully with all new regulations under the proposed rule. To the extent that non-compliance occurs, both costs and cost savings estimated in this RIA may be overstated. It is also possible that some expert opinions on specific rule impacts may not completely capture full compliance (and may therefore understate the impacts of the proposed rule), because the experience of most experts is related to implementing state regulatory programs and one issue encountered has been non-compliance. However, experts asserted that their estimates approximate full compliance, and we do not therefore attempt to adjust for non-compliance in either cost or cost-savings calculations.

[27] EPA assumes that these groundwater releases will instead become soil releases. Hypothetically, if releases are proportionally split as 50 percent groundwater and 50 percent soil before the rule takes effect, they will be split 38 percent groundwater and 62 percent soil after the rule.

Exhibit 4-4 **Avoided Groundwater Contamination Incidents**			
Expert	**Preferred Option**	**Alternative 1**	**Alternative 2**
Expert 1	1,100	1,200	380
Expert 2	470	470	210
Expert 3	330	320	260
Expert 4	560	510	530
Range	**330 – 1,100**	**320 – 1,200**	**210 - 530**
Note: See Appendices H and I for inputs and methods for calculating these values. Estimates were validated with experts to ensure they accurately capture their opinions. Specifically, Expert 1 verified that he believed the rule would result in a significant number of avoided groundwater releases.			

4.4.1 Avoided Releases Using an Alternative Baseline

EPA's primary analysis assumes that the universe of confirmed releases from UST systems remains constant over the time frame of the analysis. However, both the universe of UST systems and the release rate (defined as the number of confirmed releases divided by the number of UST systems in a given year) have declined over the last two decades.[28] This is consistent with the regulatory context of the past 20 years, in which two key factors have been driving the number of releases. First, the universe of UST systems has been declining as older, smaller tanks have been replaced by newer, larger systems. Second, many of the confirmed releases reported in the 1990s and early 2000s were "legacy" releases associated with older systems that did not meet the technical standards under 40 CFR Part 280 (e.g., tanks that were installed prior to the promulgation of the UST regulation at 40 CFR Part 280). Many of these legacy releases are discovered when tanks are removed during property transactions and other development projects.

As the number of legacy releases has declined, the declining trend in total releases has "flattened" – trend data suggest that release rates have been approximately one confirmed release per hundred tanks in recent years. In addition, it is possible that confirmed releases may *increase* in future years, as UST systems continue to age, and as new fuel blends with potentially higher corrosivity are introduced into the industry. Given this uncertainty, EPA assumes in the primary analysis that release rates remain constant.

However, to address the uncertainty associated with the number of confirmed releases, EPA also assesses avoided costs under the proposed rule using an alternative baseline that projects a continued decline in the release rate consistent with the recent historical trend, and also captures the decline in the number of UST systems as estimated in Chapter 3, Section 3.3.1. This represents a conservative avoided cost scenario because it does not account for the possibility that aging systems or changes in fuel could result in increases in the number of

[28] See Appendix J for charts and data sources that demonstrate these two trends.

confirmed releases reported, or that the number of UST systems could increase (if, for example, an expanding economy or population growth demands more service locations).

To estimate the rate of universe decline, EPA mapped historical data on the number of UST systems from 1991 through 2010 to an exponential one-phase decay function, which appears to most accurately represent the observed behavior of the UST system universe over time.[29] EPA also mapped historical data on the release rate to a similar decay function. [30] These two functions were then used to project future UST universe sizes as well as future release rates. We used the results from these two projections to estimate future number of confirmed releases.[31]

The cumulative universe of releases over 20 years under this alternative baseline is approximately 60 percent of the number of cumulative releases over 20 years in the primary analysis. The alternative baseline contains proportionally fewer releases than UST systems because two separate declining trends, UST systems and release rate, are used to estimate the future decline in releases. This compounds the projected decline in releases.

Exhibits 4-5 and **4-6** provide a summary of our findings with respect to avoided releases and avoided groundwater contamination events, respectively, assuming the alternative baseline releases occur. The alternative baseline results in a reduction of roughly 40 percent of both avoided releases and avoided groundwater contamination relative to the original baseline. Correspondingly, in the alternative baseline scenario, approximately 810 to 2,600 releases are avoided under the Preferred Option, compared to 900 to 2,800 under Alternative 1 and 250 to 2,000 under Alternative 2. Under the alternative baseline, there are approximately 200 to 650 avoided groundwater contamination incidents under the Preferred Option, 190 to 700 under Alternative 1, and 130 to 320 under Alternative 2.

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[29] See Section 3.3.1.

[30] To estimate future release rates, we used a single exponential decay function, which assumes that a quantity declines at a rate proportional to its value. This is an appropriate function given the singular and slowing rate of decline observed in the release rate over time. The equation for such an exponential singular decay function is $Y = (Yo - P) * e^{(-k*X)} + P$, where P represents the "plateau," or limit of the function and k represents the function's half-life. See Appendix J for additional details.

[31] We use release rates to project future number of releases (rather than use past trends in the number of confirmed releases) for two reasons: First, as the UST universe and release rate both appear to decline in a way approximating a single-decay exponential function, these projections can be used to estimate future number of releases without the added uncertainty of whether the release trend is truly a single-decay exponential function. In addition, using the release rate projections to estimate future releases yields a more conservative (lower) total number of releases than if we were to use the past trend in the number of releases, which leads to more conservative (lower) avoided remediation cost estimates in the alternative baseline.

Exhibit 4-5 **Avoided Releases, Alternative Baseline**			
Expert	**Preferred Option**	**Alternative 1**	**Alternative 2**
Expert 1	810	1,200	370
Expert 2	860	900	250
Expert 3	1,100	1,200	810
Expert 4	2,600	2,800	2,000
Range	**810 – 2,600**	**900 – 2,800**	**250 – 2,000**
Note: See Appendices H and I for inputs and methods for calculating these values. Estimates were validated with experts to ensure they accurately capture their opinions. Specifically, Expert 4 verified that he believed the rule would result in avoidance of over half of confirmed releases.			

Exhibit 4-6 **Avoided Groundwater Contamination Incidents, Alternative Baseline**			
Expert	**Preferred Option**	**Alternative 1**	**Alternative 2**
Expert 1	650	700	230
Expert 2	280	280	130
Expert 3	200	190	150
Expert 4	330	310	320
Range	**200 – 650**	**190 – 700**	**130 - 320**
Note: See Appendices H and I for inputs and methods for calculating these values. Estimates were validated with experts to ensure they accurately capture their opinions. Specifically, Expert 1 verified that he believed the rule would result in a significant number of avoided groundwater releases.			

4.5 Benefits from Avoided Releases and Reduced Release Severity

Two sources of avoided costs constitute the majority of quantifiable positive impacts from the proposed rule. First, some costs related to release remediation costs do not occur because a number of releases are altogether avoided. Second, some remaining releases are reduced in severity because of the proposed requirements (e.g., through earlier detection through via walkthrough inspections and improved operability of release detection equipment). To capture this dimension of avoided costs, the analysis relies on incremental avoided groundwater remediation costs—the cost to remediate a groundwater release less the cost to remediate a soil release—as groundwater releases are generally more costly to remediate than soil releases.

In addition to avoiding remediation costs, release prevention and mitigation results in a variety of other beneficial impacts, including:

- Avoided vapor intrusion damages;
- Avoided product loss;
- Human health benefits;

- Ecological benefits; and
- Protection of groundwater quality.

This section monetizes, quantifies, or otherwise describes these impacts.

4.5.1 Avoided Release Remediation

To determine the benefits of avoided releases, the analysis relies on the draft 23-state Autopsy Report's distribution of releases by source (i.e., the part of the UST system that produces the release), and applies the reduction associated with each regulation to the appropriate source to reduce the number of releases avoided by source.[32,33] Each avoided release is valued according to the weighted average of remediation costs shown in **Exhibit 4-2**.[34]

Exhibit 4-7 presents the total avoided remediation costs under each regulatory option. We estimate that discounted benefits from avoided remediation costs range between approximately $170 million and $570 under the Preferred Option, while avoided costs amount to between $190 million and $610 million under Alternative 1 and between $54 million and $440 million under Alternative 2.

Exhibit 4-7

Discounted Avoided Release Remediation Costs

Expert	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Expert 1	$170	$250	$75
Expert 2	$180	$190	$54
Expert 3	$230	$250	$170
Expert 4	$570	$610	$440
Range	**$170 - $570**	**$190 - $610**	**$54 - $440**

Note: Cost estimates were derived using a seven percent discount rate.

4.5.2 Reduction in Release Severity

To assess the impact on remediation costs associated with reduced release severity, the analysis focuses on changes in the number of releases that would have involved groundwater in the baseline, but because of the proposed rule, involve only soil. While this metric does not capture all of the release mitigation effects of the proposed requirements, groundwater avoidance

[32] We exclude the 'Other' category of releases from the draft 23-state Autopsy Report because it does not map to the reductions designated by the experts. Because 'Other' accounts for only 1 percent of releases in the study, we distribute those releases proportionally across the remaining release sources.

[33] We use five system sources to identify release types: piping, dispenser, tank, sump turbine pump area, and delivery problems. We then assign each regulation's effect to source types based on the regulation (e.g. spill prevention equipment tests are assumed to affect releases from delivery problems).

[34] This approach assumes that avoided releases are well-represented by the distribution of release severity that is identified in the draft 23-state Autopsy Report.

is likely to be among the most significant effects of the rule. The difference in remediation costs between soil and groundwater releases is substantial: remediation cost for an average groundwater release is approximately $270,000, while an average soil release costs approximately $70,000 to remediate.[35] Remediation costs across release extent and medium contaminated range from $25,250 to $428,200 based on typical site remediation costs from New Hampshire and Utah.[36]

To estimate the number of releases that are reduced in severity, we use experts' estimates of reductions in groundwater involvement and distribute them across release source, medium contaminated, and release extent.[37] We distribute remaining releases according to the draft 23-state Autopsy Report results and calculate additional benefits from remediation due to reductions in groundwater contamination following the regulation. We calculate avoided costs from reduced release severity by subtracting the cost to remediate all remaining releases after the proposed rule is in effect from the cost to remediate all remaining releases in the baseline. In both cases, we remove from consideration the same number of fully-avoided releases and consider only the avoided costs from shifting releases from groundwater to soil.

A key limitation of this approach may lead to a conservative estimate of the effects of the proposed rule. The analysis assumes that the distribution of releases across size (i.e., extent) does not change as a consequence of changes in groundwater contamination. In reality, changes in the likelihood of groundwater contamination are probably (at least in part) a consequence of reductions in release volume and duration. The same reductions in release volume that lower the incidence of groundwater contamination would likely also reduce the number of large extent releases of all types and decrease the average size of smaller releases. That is, new requirements should both reduce the number of groundwater contamination events and large extent events of all types. Our model captures only changes in the rates of groundwater contamination, and does not consider cost savings associated with smaller soil-only sites. We therefore likely understate avoided remediation costs.[38]

Exhibit 4-8 displays EPA's findings regarding discounted avoided costs due to the mitigation of groundwater incidents. The analysis calculates avoided remediation costs by taking the difference between estimated remediation costs before and after the proposed changes are implemented. This difference accounts for both the reduction in groundwater release incidents as

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[35] These costs reflect a simple average of the costs to remediate a large extent and local extent release of each medium.

[36] Release extent is classified in the draft 23-state Autopsy Report as either local or large. Releases that do not extend beyond the area excavated during remediation are considered local, while releases that extend beyond property lines are considered large. Extent does not explicitly involve a measure of release volume.

[37] See Appendix I for details on the calculation of avoided costs.

[38] A change in the distribution of releases could also potentially cause the "average size" and cost of soil-only releases to *increase* (because larger groundwater releases are eliminated but become "large" local soil-only releases). While this could result in higher average costs for local releases, (i.e., the cost savings for avoiding a groundwater release might be less than the difference between "average" groundwater and soil releases), the analysis also does not consider the cost savings associated with reducing the size of groundwater releases that still reach groundwater or the cost savings associated with reducing the size of soil releases.

well as the increase in soil contamination events.[39] EPA estimates that benefits from averted groundwater releases range from approximately $61 million to $270 million across regulatory options. Avoided costs from reduced groundwater contamination are additive to avoided costs from avoided releases.

Exhibit 4-8 **Discounted Avoided Groundwater Remediation Costs**			
Expert	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
Expert 1	$260	$270	$93
Expert 2	$110	$110	$52
Expert 3	$78	$75	$61
Expert 4	$130	$120	$130
Range	**$78 - $260**	**$75 - $270**	**$61 - $130**
Note: Cost estimates were derived using a seven percent discount rate.			

4.5.3 Total Avoided Remediation Costs from Avoided Releases and Reduced Release Severity

Exhibit 4-9 displays the sum of avoided remediation costs across both avoided releases and mitigated groundwater incidents for all four experts. Because experts with relatively lower estimates in one of these categories did not necessarily have similarly low estimates in the other, the range of total avoided costs is not the sum of the low and high ranges in **Exhibits 4-7** and **4-8**.

Exhibit 4-9 **Total Discounted Avoided Remediation Costs**			
Expert	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
Expert 1	$430	$520	$170
Expert 2	$300	$300	$110
Expert 3	$310	$330	$230
Expert 4	$700	$740	$570
Range	**$300 - $700**	**$300 - $740**	**$110 - $570**
Note: Cost estimates were derived using a seven percent discount rate.			

4.5.4 Benefits from Avoided Releases and Reduced Release Severity under the Alternative Baseline Scenario

Exhibits 4-10 and **4-11** present avoided remediation costs associated with the avoided releases and avoided groundwater incidents shown in **Exhibits 4-5** and **4-6**. In the alternative baseline scenario, avoided release remediation costs range from $100 million to $340 million

[39] This occurs because the analysis maintains the total number of releases constant: every groundwater release that is avoided still requires remediation as a soil release.

under the Preferred Option, between $110 million and $370 million under Alternative 1, and between $32 million and $260 million under Alternative 2. Averted groundwater remediation costs, meanwhile, range from $47 million to $160 million under the Preferred Option, $45 million to $160 million under Alternative 1, and $32 million to $77 million under Alternative 2. These alternative estimates represent conservative estimates of the potential value of avoided releases, because they do not consider possible factors that may lead to increases in the number of releases reported or the number of UST systems in the future.

Exhibit 4-10

Discounted Avoided Release Remediation Costs, Alternative Baseline

Expert	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Expert 1	$100	$150	$45
Expert 2	$110	$110	$32
Expert 3	$140	$150	$100
Expert 4	$340	$370	$260
Range	**$100 - $340**	**$110 - $370**	**$32 - $260**

Note: Cost estimates were derived using a seven percent discount rate.

Exhibit 4-11

Discounted Avoided Groundwater Remediation Costs, Alternative Baseline

Expert	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Expert 1	$160	$160	$56
Expert 2	$68	$68	$32
Expert 3	$47	$45	$37
Expert 4	$79	$73	$77
Range	**$47 - $160**	**$45 - $160**	**$32 - $77**

Note: Cost estimates were derived using a seven percent discount rate.

Exhibit 4-12 displays the sum of avoided remediation costs across both avoided releases and mitigated groundwater incidents under the alternative baseline scenario. Because experts with relatively lower estimates in one of these categories did not necessarily have similarly low estimates in the other, the range of avoided costs presented is not the sum of lower and higher bounds in **Exhibits 4-10** and **4-11**. As the cumulative release universe in the alternative baseline scenario is roughly 60 percent of cumulative releases in the original baseline, total avoided costs in the alternative baseline are approximately 40 percent lower than they are in the primary analysis.

Exhibit 4-12 **Total Discounted Avoided Remediation Costs, Alternative Baseline**			
Expert	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
Expert 1	$260	$310	$100
Expert 2	$180	$180	$64
Expert 3	$190	$200	$140
Expert 4	$420	$440	$340
Range	**$180 - $420**	**$180 - $440**	**$64 - $340**
Note: Cost estimates were derived using a seven percent discount rate.			

4.5.5 Avoided Costs by Proposed Requirement

Exhibit 4-13 presents overall avoided costs by proposed requirement and regulatory option. The exhibit shows ranges of the avoided costs for each proposed requirement based on experts' responses to the effects of the individual requirements in the proposed rule. Beneficial impacts are concentrated similarly to costs: the majority of avoided costs are captured by walkthrough inspections, overfill prevention equipment tests, spill prevention equipment tests, interstitial integrity tests, and operability tests.[40] Estimates in **Exhibit 4-13** assume that cost savings associated with each regulatory requirement occur one year after the implementation and reflect discounting.

Under the Preferred Option, total avoided costs are approximately $300 million to $700 million per year. Avoided costs increase to $300 million to $740 million under Alternative 1, largely due to more frequent overfill prevention equipment tests and interstitial integrity tests. Avoided costs under Alternative 2 are $110 million to $570 million per year, where less frequent walkthrough inspections and no requirement for interstitial integrity tests reduce beneficial impacts by approximately 19 percent to 65 percent compared to the Preferred Option.

We note that the model used by EPA to estimate avoided remediation costs is not designed to measure avoided costs from large-scale releases such as those typically associated with FCTs and AHFDSs. We, therefore, do not offer an estimate of avoided costs for

[40] Some proposed requirements, particularly those that target narrow subpopulations of the UST system universe, may generate higher avoided costs than this analysis suggests. Three sources of uncertainty drive these smaller universe results. First, EPA's model is calibrated to estimate avoided costs for broad-based national changes at average facilities; extrapolation of these results to small populations may not reflect specific subpopulations (e.g., UST systems in Indian country). Second, several experts stated that their estimates of impacts for requirements affecting narrow subsets of UST populations are more uncertain than broader estimates. Finally, experts emphasized that equipment replacement, inspection, training, and testing are all essential to ensure release reductions, and they used judgment to emphasize the different roles of these different activities. Therefore, the assignment of specific impacts to each of the proposed requirements is potentially less accurate than the aggregate estimates of avoided impacts.

requirements that apply to these systems. However, we include a qualitative discussion of these acute events later in this chapter.

Exhibit 4-13

Total Discounted Avoided Cost By Proposed Requirement[a, h]

Description [b, c]	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Release Prevention			
Walkthrough inspections	$94.0 - $570	$93.0 - $550	$44.0 - $480
Periodic testing of: - Overfill prevention equipment - Spill prevention equipment - Interstitial integrity	$70.0 - $140	$91.0 - $170	$35.0 - $70.0
Testing after repairs to spill and overfill prevention equipment, and interstices	$1.50 - $13.0	$1.50- $12.0	$1.50 - $13.0
Elimination of flow restrictors in vent lines for all new tanks and when overfill devices are replaced	$0.170 - $12.0	$0.150 - $12.0	$0
Subtotal - Release Prevention[d]	**$260 - $660**	**$270 - $670**	**$92.0 - $550**
Release Detection			
Operability tests for release detection methods	$25.0 - $43.0	$25.0 - $43.0	$8.60 - $17.0
Eliminate groundwater and vapor monitoring as release detection methods	Not estimated. See note e.		
Add SIR/CITLD to regulations with performance criteria	$0.140 - $1.80	$0.140 - $1.80	$0.140 - $1.90
Remove deferral for emergency generator tanks	$0.530 - $6.20	$0.530 - $6.20	$0.530 - $6.30
Change release detection leak rate probabilities	$0	$0 - $21.0	$0
Response to interstitial monitoring alarms	$0 - $0.850	$0 - $0.820	$0 - $0.890
Subtotal - Release Detection[d]	**$32.0 - $49.0**	**$32.0 - $70.0**	**$10.0 - $24.0**
Other			
Remove deferral for airport hydrant fuel distribution systems	Not estimated. See note f.		
Remove deferral for UST systems with field-constructed tanks	Not estimated. See note f.		
Require notification of ownership change	$0	$0	$0
Closure of lined tanks that cannot be repaired according to a code of practice	$0.001 - $0.240	$0.001 - $0.240	$0.001 - $0.250
Requirements for determining compatibility	Not estimated. See note g.		
Subtotal – Other[d]	**$0.001 - $0.240**	**$0.001 - $0.240**	**$0.001 - $0.250**
EPAct-related Provisions			
Operator training	$0.015 - $1.20	$0.015 - $1.10	$0.018 - $1.30
Secondary containment	$0.370 - $1.10	$0.360 - $1.10	$0.470 - $1.10
Subtotal - EPAct-related Provisions[d]	**$1.00 - $2.00**	**$1.00 - $1.90**	**$1.10 - $2.10**
Total[d]	**$300 - $700**	**$300 - $740**	**$110 - $570**

[a] For each proposed requirement, this exhibit presents a range of discounted avoided costs. This range represents the lowest avoided cost estimate for the proposed requirement among the four experts and the highest avoided cost estimate for the proposed requirement among the four experts.

[b] For some requirements, such as removing the deferral for emergency generator tanks, avoided costs under Alternative 2 are higher than under the Preferred Option or Alternative 1. This occurs because: 1) these requirements create groundwater contamination reductions; and 2) fewer releases are altogether avoided under Alternative 2. This combination of factors implies that groundwater reductions have a greater effect under Alternative 2, as they affect a larger number of releases. This effect is very small compared to the magnitude of changes in other requirements.

Exhibit 4-13 **Total Discounted Avoided Cost By Proposed Requirement**[a, h]			
Description [b, c]	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
[c] Some proposed requirements, particularly those that target narrow subpopulations of the UST system universe, may generate higher avoided costs than this analysis suggests. Three sources of uncertainty drive these smaller universe results: First, EPA's model is calibrated to estimate avoided costs for broad-based national changes at average facilities; extrapolation of these results to small populations may not reflect specific subpopulations (e.g., UST systems in Indian country). Second, several experts stated that their estimates of impacts for requirements affecting narrow subsets of UST populations are more uncertain than broader estimates. Finally, experts emphasized that equipment replacement, inspection, training, and testing are all essential to ensure release reductions, and they used judgment to emphasize the different roles of these different activities. Therefore, the assignment of specific impacts to each of the proposed requirements is potentially less accurate than the aggregate estimates of avoided impacts. [d] Subtotals and totals presented in this table do not represent the sums of the ranges across the proposed requirements because experts with relatively lower estimates for one proposed requirement did not necessarily have similarly low estimates for other requirements. Instead, the subtotals and totals shown represent the lowest and highest estimates among the four experts for each subtotal group and for the total across all proposed requirements. [e] Experts were not asked to estimate avoided costs resulting from the elimination of groundwater and vapor monitoring. EPA decided to include this requirement after consulting with its experts. [f] Reductions in frequency and release severity (as measured by changes in groundwater contamination) do not adequately capture the positive impacts of preventing releases from very large systems such as AHFDSs and UST systems with FCTs. Releases from these types of systems constitute a small portion of total releases, but may be large in volume and can result in significant groundwater impacts. Especially in the case of AHFDSs, even minor problems can create large releases due to the significant pressure under which contents are stored. The model used by EPA to estimate avoided remediation costs is not designed to measure avoided costs from very large releases such as those typically associated with AHFDSs and FCTs, and we therefore do not offer an estimate of avoided costs for requirements that apply to these systems. [g] Experts were not asked to estimate avoided costs resulting from requirements for determining compatibility. EPA decided to include this requirement after consulting with its experts. [h] Cost estimates were derived using a seven percent discount rate.			

As noted in **Exhibit 4-1**, EPA excluded the highest state-level remediation cost values from its calculation of average cost of release remediation. While this step contributes toward a more conservative estimate of avoided costs, the possibility remains that the average remediation costs used in **Exhibit 4-13** overestimate the positive impacts of the proposed rule if state data provided are not representative of national average remediation costs. In **Exhibit 4-14**, we therefore estimate the positive effects of the proposed rule using only the lowest remediation costs available.[41] As shown in **Exhibit 4-14,** EPA's estimate of the avoided costs of the proposed rule using the lowest state cost estimates is $190 million to $460 million per year under the Preferred Option. This estimate increases to a range of $190 million to $480 million per year under Alternative 1 and decreases to a range of $66 million to $370 million per year under Alternative 2. While this is not a true "lower bound" estimate, these estimates reflect costs that lead to lower than average costs when compared to figures reported by ASTSWMO.[42]

[41] These were provided by the State of New Hampshire's UST program.

[42] If we calculate a weighted-average cost per release where sources are weighted proportionally by their contribution to total releases using the lowest remediation cost data available (i.e., from New Hampshire), we obtain an overall average cost per release of approximately $96,000 (See memo in Appendix I for details). For reference, ASTSWMO estimates the average cost per site to be roughly $127,000 in 2009. See Association of State and Territorial Solid Waste Management Officials, State Fund Survey Results 2009.

Exhibit 4-14

Sensitivity Analysis: Total Discounted Avoided Cost By Proposed Requirement Based On New Hampshire Remediation Costs[a, h]

Description [b, c]	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Release Prevention			
Walkthrough inspections	$55.0 - $370	$54.0 - $360	$25.0 - $310
Periodic testing of: - Overfill prevention equipment - Spill prevention equipment - Interstitial integrity	$46.0 - $96.0	$61.0 - $110	$24.0 - $47.0
Testing after repairs to spill and overfill prevention equipment, and interstices	$1.00 - $8.00	$1.00 - $8.00	$1.00 - $8.20
Elimination of flow restrictors in vent lines for all new tanks and when overfill devices are replaced	$0.120 - $8.10	$0.100 - $8.10	$0
Subtotal - Release Prevention[d]	**$170 - $430**	**$170 - $440**	**$57.0 - $350**
Release Detection			
Operability tests for release detection methods	$15.0 - $27.0	$15.0 - $27.0	$5.00 - $10.0
Eliminate groundwater and vapor monitoring as release detection methods	Not estimated. See note e.		
Add SIR/CITLD to regulations with performance criteria	$0.090 - $1.10	$0.090 - $1.10	$0.090 - $1.20
Remove deferral for emergency generator tanks	$0.340 - $3.80	$0.340 - $3.80	$0.340 - $3.90
Change release detection leak rate probabilities	$0	$0 - $13.0	$0
Response to interstitial monitoring alarms	$0 - $0.520	$0 - $0.500	$0 - $0.540
Subtotal - Release Detection[d]	**$20.0 - $31.0**	**$20.0 - $44.0**	**$6.00 - $15.0**
Other			
Remove deferral for airport hydrant fuel distribution systems	Not estimated. See note f.		
Remove deferral for UST systems with field-constructed tanks	Not estimated. See note f.		
Require notification of ownership change	$0	$0	$0
Closure of lined tanks that cannot be repaired according to a code of practice	$0.001 - $0.150	$0.001 - $0.150	$0.001 - $0.150
Requirements for determining compatibility	Not estimated. See note g.		
Subtotal – Other[d]	**$0.001 - $0.150**	**$0.001 - $0.150**	**$0.001 - $0.150**
EPAct-related Provisions			
Operator training	$0.009 - $0.750	$0.009 - $0.700	$0.011 - $0.810
Secondary containment	$0.240 - $0.760	$0.230 - $0.760	$0.300 - $0.770
Subtotal - EPAct-related Provisions[d]	**$0.670 - $1.30**	**$0.640 - $1.20**	**$0.760 - $1.40**
Total[d]	**$190 - $460**	**$190 - $480**	**$66.0 - $370**

Exhibit 4-14

Sensitivity Analysis: Total Discounted Avoided Cost By Proposed Requirement Based On New Hampshire Remediation Costs[a, h]			
Description [b, c]	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**

[a] For each proposed requirement, this exhibit presents a range of discounted avoided costs. This range represents the lowest avoided cost estimate for the proposed requirement among the four experts and the highest avoided cost estimate for the proposed requirement among the four experts.
[b] For some requirements, such as removing the deferral for emergency generator tanks, avoided costs under Alternative 2 are higher than under the Preferred Option or Alternative 1. This occurs because: 1) these requirements create groundwater contamination reductions; and 2) fewer releases are altogether avoided under Alternative 2. This combination of factors implies that groundwater reductions have a greater effect under Alternative 2, as they affect a larger number of releases. This effect is very small compared to the magnitude of changes in other requirements.
[c] Some proposed requirements, particularly those that target narrow subpopulations of the UST system universe, may generate higher avoided costs than this analysis suggests. Three sources of uncertainty drive these smaller universe results: First, EPA's model is calibrated to estimate avoided costs for broad-based national changes at average facilities; extrapolation of these results to small populations may not reflect specific subpopulations (e.g., UST systems in Indian country). Second, several experts stated that their estimates of impacts for requirements affecting narrow subsets of UST populations are more uncertain than broader estimates. Finally, experts emphasized that equipment replacement, inspection, training, and testing are all essential to ensure release reductions, and they used judgment to emphasize the different roles of these different activities. Therefore, the assignment of specific impacts to each of the proposed requirements is potentially less accurate than the aggregate estimates of avoided impacts.
[d] Subtotals and totals presented in this table do not represent the sums of the ranges across the proposed requirements because experts with relatively lower estimates for one proposed requirement did not necessarily have similarly low estimates for other requirements. Instead, the subtotals and totals shown represent the lowest and highest estimates among the four experts for each subtotal group and for the total across all proposed requirements.
[e] Experts were not asked to estimate avoided costs resulting from the elimination of groundwater and vapor monitoring. EPA decided to include this requirement after consulting with its experts.
[f] Reductions in frequency and release severity (as measured by changes in groundwater contamination) do not adequately capture the positive impacts of preventing releases from very large systems such as AHFDSs and UST systems with FCTs. Releases from these types of systems constitute a small portion of total releases, but may be large in volume and can result in significant groundwater impacts. Especially in the case of AHFDSs, even minor problems can create large releases due to the significant pressure under which contents are stored. The model used by EPA to estimate avoided remediation costs is not designed to measure avoided costs from very large releases such as those typically associated with AHFDSs and FCTs, and we therefore do not offer an estimate of avoided costs for requirements that apply to these systems.
[g] Experts were not asked to estimate avoided costs resulting from requirements for determining compatibility. EPA decided to include this requirement after consulting with its experts.
[h] Cost estimates were derived using a seven percent discount rate.

For reference, we also estimate avoided costs using ASTSWMO's reported average cleanup cost of $127,216 for 2009. If we value the releases and groundwater incidents avoided under each option using this estimate, we obtain total avoided costs of approximately $250 million to $610 million under the Preferred Option, $250 million to $640 million under Alternative 1, and $87 million to $490 million under Alternative 2. Note that these values fall between our primary estimates and sensitivity analyses.[43]

[43] Under the alternative baseline, total avoided costs based on New Hampshire remediation costs range from $110 million to $280 million in the Preferred Option. This represents an extreme lower bound analysis of avoided remediation costs.

4.6 Avoided Vapor Intrusion Damages

Vapor intrusion generally occurs when petroleum or highly-dissolved concentrations come into direct contact with building sumps and foundations, elevator shafts, and preferential pathways (e.g. improperly sealed utility lines). Intrusion can also occur when these substances come close to building foundations.[44] The cost to remediate vapor intrusion is typically incremental to the cost to remediate a LUST site. Based on information provided by four states, EPA estimates that from one to 10 percent of all releases cause vapor intrusion issues. Each of these instances requires additional remedial actions valued between $27,000 and $52,000 beyond ordinary release remediation costs.[45] As reported in **Exhibit 4-15**, given 1,680 to 5,370 avoided releases and mitigated groundwater incidents, we estimate between 17 and 540 avoided vapor intrusion incidents under the Preferred Option. This reduction would avoid between $0.4 million and $26 million per year in avoided remediation costs related to vapor intrusion. While the lower end of this range does not vary significantly among the options, EPA estimates savings of up to $28 million under Alternative 1 and $19 million under Alternative 2.

Exhibit 4-15

Avoided Vapor Intrusion Costs

Scenario	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
Total avoided releases and avoided groundwater incidents	1,680 - 5,370	1,820 - 5,780	630 - 3,860
Low *1% of releases involve vapor intrusion* *$27,000 per release to remediate*	$0.4 - $1.4	$0.5 - $1.5	$0.2 - $1.0
High *10% of releases involve vapor intrusion* *$52,000 per release to remediate*	$8.2 - $26.0	$8.9 - $28.0	$3.1 - $19.0

Under the alternative baseline, avoided vapor intrusion costs fall due to the smaller universe of releases. In the Preferred Option, avoided costs are $0.3 million to $16.0 million. Under Alternative 1, avoided costs range from $0.3 million to $17 million; under Alternative 2, they range between $0.1 million and $11.0 million. See **Exhibit 4-20** for a full accounting of avoided costs in the alternative baseline.

4.7 Product Loss

Releases into the environment cause operators to lose otherwise marketable fuel products. **Exhibit 4-16** presents costs avoided due to product loss. The analysis calculates the product loss

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[44] Davis, Robin V. February 9, 2010. "Petroleum Hydrocarbon Vapor Intrusion Investigations: Current General Practice," Leaking Underground Storage Tanks, Utah Dept. of Environmental Quality, http://www.epa.gov/oust/pviwebinar_approach.pdf.

[45] New Hampshire, Utah, South Carolina, Virginia, and New Mexico were contacted for LUST remediation costs, but only New Hampshire was able to provide a cost for cleanup actions related to vapor intrusion. Other state programs contributed data to the frequency of incidents, but not to costs.

associated with avoided releases by multiplying the average volume associated with each release source by the number of releases of that type before and after the proposed rule is in effect. Based on the estimates of avoided releases presented by the experts, the draft 23-state Autopsy Report's distribution of releases, and average release volumes reported in the Florida study, EPA estimates that approximately 0.64 million gallons to 2.3 million gallons per year of diesel and gasoline releases are avoided as a consequence of the Preferred Option. At an average price of $3.27 per gallon, owners and operators avoid losing approximately $2.0 million to $7.2 million in product due to releases.[46] These values increase to a range of 0.84 million gallons to 2.5 million gallons and $2.6 million to $7.6 million under Alternative 1 and decrease to a range of 0.13 million gallons to 1.7 million gallons and $0.4 million to $5.3 million under Alternative 2. Limited data on release size do not support an analysis of avoided product loss associated with releases that are reduced in severity.

Exhibit 4-16

Value of Avoided Product Loss

Expert	**Preferred Option**		**Alternative 1**		**Alternative 2**	
	Thousand gallons	**$ millions**	**Thousand gallons**	**$ millions**	**Thousand gallons**	**$ millions**
Expert 1	640	$2.0	950	$2.9	200	$0.6
Expert 2	800	$2.5	840	$2.6	130	$0.4
Expert 3	810	$2.5	860	$2.6	570	$1.7
Expert 4	2,300	$7.2	2,500	$7.6	1,700	$5.3
Range	**640 – 2,300**	**$2.0 - $7.2**	**840 - 2,500**	**$2.6 - $7.6**	**130 – 1,700**	**$0.4 - $5.3**

Releases are valued using an average price of motor fuel for 2008. Prices per gallon for all grades of retail motor gasoline and No. 2 diesel fuel (all concentrations of sulfur) were $3.32 and $3.15, respectively, as reported by the Bureau of Transportation in Table 3-8: Sales Price of Transportation Fuel to End-Users in National Transportation Statistics 2010 (at http://www.bts.gov/publications/national_transportation_statistics/pdf/entire.pdf). We weight these prices according to prime supplier sales volumes in 2009 published by the Energy Information Administration, which summed to 362,798.5 thousands of gallons per day for gasoline and 132,489.3 thousands of gallons per day for all grades of diesel fuel (at http://www.eia.gov/dnav/pet/pet_cons_prim_dcu_nus_a.htm).

Under the alternative baseline, avoided costs due to product loss are lower than in the original baseline as there are relatively fewer releases. In the Preferred Option, avoided costs due to product loss are $1.2 million to $4.3 million. Under Alternative 1, avoided costs range from $1.6 million to $4.6 million; under Alternative 2, they range between $0.2 million and $3.2 million. See **Exhibit 4-20** for a full accounting of avoided costs in the alternative baseline scenario.

[46] Releases are valued using an average price of motor fuel for 2008. Prices per gallon for all grades of retail motor gasoline and No. 2 diesel fuel (all concentrations of sulfur) were $3.32 and $3.15, respectively, as reported by the Bureau of Transportation in Table 3-8: Sales Price of Transportation Fuel to End-Users in National Transportation Statistics 2010 (at http://www.bts.gov/publications/national_transportation_statistics/pdf/entire.pdf). We weight these prices according to prime supplier sales volumes in 2009 published by the Energy Information Administration, which summed to 362,798.5 thousands of gallons per day for gasoline and 132,489.3 thousands of gallons per day for all grades of diesel fuel (at http://www.eia.gov/dnav/pet/pet_cons_prim_dcu_nus_a.htm)

4.8 Human Health Benefits

Exposure to petroleum through ingestion, dermal contact, and inhalation can cause a range of health effects, including cancer and non-cancer impacts associated with benzene, and non-cancer impacts (e.g., neurological impacts) associated with other petroleum constituents such as toluene.[47] Reductions in the number and severity of releases will reduce these exposures and associated morbidity and mortality impacts. This benefits assessment examines the impacts of the regulations under consideration on population cancer risks associated with benzene exposures through groundwater. Other health impacts, including benzene-related risks through inhalation of vapor and nonbenzene health effects, are not able to be reliably quantified with available data, but represent additional potential benefits of the rule.

4.8.1 Avoided Benzene Cancer Risk

To address human health benefits associated with avoided exposure to benzene through groundwater, EPA performed a screening analysis using data on:

- Expected number of cancer cases per underground storage tank release;
- Estimated number of releases prevented through implementation of the regulatory revisions; and,
- Estimated WTP to avoid a fatal cancer, expressed as the value of a statistical life (VSL).

The EPA risk assessment provides population risk estimates on a per-release basis, expressed as the expected number of cancer cases per release. That analysis estimated population risk for releases of varying volumes and plume ages.[48] To estimate the benefits of avoided cancer cases, EPA uses the estimated number of releases avoided and releases reduced in severity and applies the 2009 EPA estimated value of a statistical life (VSL) of $8.9 million as the value associated with avoiding one terminal cancer.[49,50]

Exhibit 4-17 presents EPA's findings for four avoided release scenarios. The analysis shows that, even under unlikely assumptions of 100-year plumes and 5,000 gallon releases, total upper bound human health benefits due to avoided cancer cases are limited to approximately

[47] For example, see "Benzene toxicity and risk assessment, 1972-1992: implications for future regulation," D J Paustenbach, R D Bass, and P Price, Environ Health Perspect. 1993 December; 101(Suppl 6):177–200.

[48] "Risk Analysis to Support Potential Revisions to Underground Storage Tank (UST) Regulations," prepared by RTI International, December 22, 2010.

[49] "Summary of the updated Regulatory Impact Analysis (RIA) for the Reconsideration of the 2008 Ozone National Ambient Air Quality Standard (NAAQS)," U.S. EPA, http://www.epa.gov/ttn/ecas/regdata/RIAs/s1-supplemental_analysis_full.pdf

[50] This screening analysis also does not address the issue of latency, or discounting the VSL to reflect health effects that occur many years after exposure.

$850,000 per year under the Preferred Option. This value changes little when considering Alternatives 1 or 2. EPA's central estimate of the benefits associated with avoided cancer incidence uses avoided costs from scenarios in which plume ages are one and five years and average release volume is 50 gallons, consistent with release data from available studies.[51] These assumptions suggest human health benefits of approximately $1,400 to $4,500 per year associated with avoided benzene-related cancer risk.

These modest findings reflect a number of assumptions that may provide an incomplete picture of the risks associated with leaks from underground storage tanks. First, they reflect the frequency of confirmed releases, and (except in the 100-year spill time frame) the assumption that the existing UST cleanup program eliminates all exposure immediately upon release discovery. In addition, the risk assessment did not consider larger-scale releases over 5,000 gallons in any scenario, though a number of these are reported annually. Finally, exposure scenarios generally reflect behavioral assumptions that exposed individuals will limit their own exposure in certain cases (e.g., when petroleum contamination exceeds a "taste/odor threshold" and water is no longer palatable). Any or all of these assumptions may not hold in all cases, and other risks and health benefits are not reflected at all in this screening level risk assessment (see below). However, it is also not unreasonable to assume that health impacts under this proposed rule would be limited, given the baseline existence of technical and cleanup requirements designed to minimize human exposure.

[51] U.S. Environmental Protection Agency, Office of Underground Storage Tanks, "Petroleum Releases at Underground Storage Tank Facilities in Florida," draft, March 2005. Note that this estimate differs from the calculated avoided product loss based on average release volumes in the Florida autopsy data. We use a more conservative estimate of release volumes (consistent with median release volumes from Florida's autopsy study) to reflect uncertainty regarding exposure and to offset the risk analysis assumption that releases occur over a very short time frame.

Exhibit 4-17

Discounted Benefits From Benzene Cancer Avoidance[d]

Release time to discovery and volume [a,b,c]	Preferred Option ($ thousands)	Alternative 1 ($ thousands)	Alternative 2 ($ thousands)
Total releases	1,680 - 5,370	1,820 - 5,780	630 - 3,860
1 year until discovery, 10 gals. release *Prob(Cancer Case) = 0.000000012*	$0.15 - $0.49	$0.17 - $0.53	$0.06 - $0.35
1 year until discovery, 50 gals. released *Prob(Cancer Case) = 0.000000032*	$0.43 - $1.4	$0.47 - $1.5	$0.16 - $0.99
5 years until discovery, 50 gals. released *Prob(Cancer Case) = 0.00000017*	$2.4 - $7.6	$2.6 - $8.2	$0.89 - $5.5
100 year until discovery, 5,000 gals. release *Prob(Cancer Case) = 0.000019*	$270 - $850	$290 - $910	$100 - $610
Primary estimate (average of 50 gal. release over 1 and 5 years)	$1.4 - $4.5	$1.5 - $4.8	$0.53 - $3.2

[a] The pathway assessed to evaluate avoided cancer risk is benzene exposure through contaminated groundwater.
[b] Calculations based on a value of statistical life of $8.9 million, as presented in U.S. EPA, “Summary of the updated Regulatory Impact Analysis (RIA) for the Reconsideration of the 2008 Ozone National Ambient Air Quality Standard (NAAQS).”
[c] Probability of cancer cases per release based on RTI International, “Risk Analysis to Support Potential Revisions to Underground Storage Tank (UST) Regulations,” December 22, 2010.
[d] Estimates were derived using a seven percent discount rate.

Under the alternative baseline, the total upper bound human health benefits due to avoided cancer cases are limited to approximately $510,000 per year under the Preferred Option. The central estimate of the benefits associated with avoided cancer incidence suggests human health benefits of approximately $840 to $2,700 per year associated with avoided benzene-related cancer risk. See **Exhibit 4-20** for a full accounting of avoided costs in the alternative baseline scenario.

4.8.2 Other Human Health Benefits

The foregoing benefits from avoided benzene cancer avoidance represent only one portion of the health risk associated with releases from leaking UST systems. The risk assessment examined only benzene risks through groundwater ingestion and shower inhalation and focused on average population risks. Such risks are limited in part because the analysis concluded that many sites do not have residents using groundwater near the area affected by a plume. Nevertheless, the risk assessment concluded that some larger releases may have significant human health risks associated with them.

Inhalation risks associated with direct exposure to vapor and other petroleum-related chemicals were not evaluated.[52] While EPA does not expect most instances of these risks to be

[52] Neither cancer nor non-cancer risks of these types were evaluated.

large, significant risks remain for a subset of releases. To the extent that the proposed rule would prevent or mitigate the most significant releases, this analysis may understate the avoided human health impacts associated with the rule.

More broadly, the complex nature of petroleum mixtures and the limited toxicological data available both for petroleum mixtures and for individual component compounds of petroleum limits EPA's ability to comprehensively document the health effects associated with the most significant releases. However, the toxicological testing that has been conducted on some common components of total petroleum hydrocarbons (TPH) suggests that exposures to TPH through inhalation or ingestion could result in the following effects:

- Neurological effects, such as central nervous system depression, have been associated with acute and chronic exposures to toluene and xylenes; n-hexane exposure has been associated with effects on peripheral neuropathy;
- Hematological effects associated with oral and inhalation exposure to benzene and with oral and inhalation exposure to naphthalene;
- Renal and hepatic effects associated with BTEX compounds and other aromatic hydrocarbon compounds;
- Developmental effects associated with intermediate exposures to ethylbenzene and xylenes; and
- Carcinogenic effects of oral exposures to certain polycyclic aromatic hydrocarbons (PAHs) including benzo(a)pyrene, benz(a)anthracene, and dibenz(a,h)anthracene.[53]

Reduced exposure to TPH as a result of the proposed rule could therefore have nonquantified benefits related to reducing the risks of one or more of the above health effects.

4.9 Avoided Acute Exposure Events and Large-Scale Releases

Most health effects associated with leaking underground storage tanks reflect long-term exposures, but some releases from UST systems relate to acute events such as fire or explosion. These releases can involve acute exposures, large volumes of free product, extensive ecological damage, and injuries and death, depending on the circumstances of the event. Because these events are difficult to predict and infrequent, it is not possible to quantify or monetize the impact associated with avoiding them, but the response, remediation, and medical costs associated with a single acute incident could be significant. The proposed regulations are designed to ensure effective maintenance of UST systems, and one benefit will be to reduce the chances of an acute event that could result in a large-scale release and its associated damages (e.g., a well-maintained UST system is less likely to be in a condition where it may explode).

[53] United States Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, "Toxicological Profile for Polycyclic Aromatic Hydrocarbons," August 1995.

Acute events are especially important in the case of UST systems such as airport hydrant fuel distribution systems and UST systems with field-constructed tanks, which can hold large volumes of fuel. Releases from these systems can be large in volume and can result in significant groundwater and other environmental and health impacts. For instance, an estimated 300,000 to 500,000 gallons of fuel was released from a 2.1 million gallon underground field-constructed tank at a fuel depot in Portsmouth, VA that was in operation from the 1950s to mid-1980s. Free product was found within 20 feet of a nearby creek in 1987. To date, approximately 143,000 gallons of product have been recovered.[54]

Another example of the potential magnitude of the releases from these systems is Pease Air Force Base, where jet fuel was delivered to the runway apron via an underground fueling system.[55] Historical leakage from the system contaminated soil and groundwater, forming groundwater plumes at many sites along the system.[56] A site release study identified 60 to 70 release points with varying degrees of severity along the refueling system line with free product found under the apron at closure.[57] While there are no historical records available indicating the amount of leaked fuel or leak origins, the presence of residual soil and groundwater contamination poses a significant threat to human health and the environment.

While the analytical procedure used by EPA to estimate benefits was unable to capture the positive impacts of preventing releases from these types of systems, we note that preventing or mitigating these releases may generate substantial reductions in remediation costs.

4.10 Ecological Benefits

A document prepared for EPA outlines the types of ecological damages that can result from land-based pollution releases:[58]

> Measurable damage to ecological resources from land releases generally occurs when groundwater or overland flow of water carry contaminants to a nearby surface water body. Flood events and other acute incidents can cause releases of waste that have an immediate and significant effect on

[54] Phone conversation and email from Lynne Smith, Geologist, VA DEQ and Russ Ellison, VA DEQ.

[55] New Hampshire Department of Environmental Services, Air Resources Division. 2007. Permit Application Review Summary, Former Pease AFB Remediation Project, FY04-0453. 10 March 2010 < http://www2.des.state.nh.us/OneStopPub/Air/3301590780FY04-0453TypeSummary.pdf>.

[56] New Hampshire Department of Environmental Services, Air Resources Division. 2009. Permit Application Review Summary, Former Pease AFB Remediation Project, 09-0113. 10 March 2010, see: http://www2.des.state.nh.us/OneStopPub/Air/330159094909-0113TypeSummary.pdf.

[57] Hilton, Scott. Site Summaries Pease Air Force Base Newington/Portsmouth. 2008. NH Department of Environmental Services. 10 March 2010 see: http://des.nh.gov/organization/divisions/waste/hwrb/fss/superfund/summaries/pease.htm.

[58] "Approaches to Assessing the Benefits, Costs, and Impacts of the RCRA Subtitle C Program," prepared by Industrial Economics, Inc. for U.S. EPA Office of Solid Waste, October 2000, p. 3-17, accessed at http://www.epa.gov/oswer/docs/rcradocs/rcra.pdf.

ecological resources (e.g., a surface impoundment dike fails and releases contaminants into a river, killing fish and other biota). More common are gradual increases in contaminant levels due to long-term releases to groundwater. These may have a broad array of impacts on both resources used by humans (such as fish populations) and on "non-use value" such as the value of preserving habitat and species diversity. In addition, biota can be affected by uptake of contaminants from soil, particularly in wetlands or areas where the water table is high.

Because of their locations, releases from underground storage tanks would likely be classified as land releases. Thus, any releases avoided due to the proposed rule may result in ecological benefits. A complete assessment of ecological benefits, however, requires significant location-specific data, and it is often difficult to identify sufficient data to support valuation of both use and non-use values of preserving habitat and species diversity.

The ecological benefits that accrue from the proposed rule are likely to occur as a consequence of averted groundwater contamination. The resource economics literature contains numerous examples of studies that value these services, as demonstrated by the public's WTP for groundwater protection programs (e.g., see Poe et al. 2001).[59] However, these values are largely context-specific in terms of location, scale, and the specific threat to groundwater considered and do not provide broadly-applicable information on the value of groundwater.

Some attempts have been made to develop standardized values for groundwater, often for purposes of Natural Resource Damage Assessment (NRDA).[60] For instance, the State of New Jersey currently employs a replacement cost approach to determine interim economic losses associated with injuries to groundwater.[61] Even so, replacement cost methods do not constitute a proper WTP valuation. The replacement cost of natural resources and their services capture WTP only when they meet three criteria: 1) replacement provides equivalent quality and quantity of services; 2) the public is actually willing to pay for the replacement; and 3) replacement is the most cost-effective means of restoring the lost services.[62] Even if these conditions are true, this approach may overestimate groundwater values in urban areas, as land is typically more expensive, and underestimate groundwater values in areas where land is less expensive.

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[59] Poe, Gregory L., K.J. Boyle, and J.C. Bergstrom. "A Preliminary Meta Analysis of Contingent Values for Ground Water Revisited." Chapter 8 in The Economic Value of Water Quality. Bergstrom, J.C., K.J. Boyle and G.L. Poe (eds.), Cheltenham, United Kingdom: Edward Elgar Publishing Limited. 2001.

[60] Natural Resource Damage Assessment (NRDA) is the process of estimating the monetary cost of restoring natural resources injured by discharges of oil or releases of hazardous substances. Monetary costs, or damages, are estimated by identifying the services provided by the injured natural resources, determining the baseline level of the services provided by the resources, and quantifying the reduction in services that result from the natural resource injury. U.S. EPA. Natural Resource Damage Assessment. www.epa.gov/ superfund/ programs/nrd/nrda2.htm.

[61] New Jersey's approach follows three steps. First, the approach determines the total present value of potential yield from the contaminated area over the relevant period of impairment, typically based on a site-specific or regional recharge rate for the area in question. Second, again considering regional recharge rates, it estimates the amount of land required to protect an equivalent present value total volume of groundwater. Finally, the approach identifies and appraises candidate parcels. The cost of acquiring such a parcel for purposes of protecting a volume of groundwater equivalent to what was lost represents the measure of damages.

[62] Freeman, A.M. III.. *The Measurement of Environmental and Resource Values: Theory and Methods.* Resources for the Future: Washington, DC. 2003. p. 460.

Because an assessment of the value of groundwater protected by the proposed rule is affected by spatial heterogeneity, it requires information about the public's WTP for protection in all states and territories. These data are not available, and EPA is therefore unable to place a value on the groundwater protected. Instead, we provide an estimate below of the total quantity of groundwater that may be protected by the rule. We note, though, that a portion of the value of restoring groundwater is captured as part of the cost to remediate each release discussed earlier in this chapter. However, while the cost of restoring groundwater to a higher quality after contamination is captured as part of the cost to remediate each release, it cannot be assumed that remediation captures WTP. In many cases, performing remediation to "safe" levels does not fully eliminate contamination, and therefore does not restore the resource to its original value. Therefore, while a significant portion of the value of the quantity of groundwater protected may be captured by the avoided remediation costs, it may not reflect the full WTP of groundwater protection.

Exhibit 4-18 summarizes a screening assessment of the volume of groundwater contamination potentially avoided because of reductions in releases and groundwater contamination incidents. The analysis relies on the EPA risk assessment, which describes typical volumes of groundwater affected by releases of different sizes over various discovery time frames.[63] EPA's analysis estimates that 40 billion gallons to 130 billion gallons of groundwater per year are protected under conservative assumptions of 10 gallon release volumes that migrate for only one year before discovery. Under the upper bound conditions of 5,000 gallon release volumes and 100 year lifetimes, up to 5.7 trillion gallons of groundwater per year would be potentially protected by the regulatory changes.[64] We also calculate the impact of 50 gallon releases over one- and five-year time frames. These releases appear most consistent with empirical data in the draft 23-state Autopsy Report. Assuming that 50 gallon releases and one- to five-year time frames represent the average parameters of avoided releases, we estimate that approximately 110 to 350 billion gallons of groundwater would be protected annually from LUST-related releases due to the potential regulatory changes.[65]

[63] "Risk Analysis to Support Potential Revisions to Underground Storage Tank (UST) Regulations," prepared by RTI International, December 22, 2010.

[64] The risk assessment on which this analysis is based did not estimate groundwater contamination volumes outside of a one-mile radius about the point of release. The assessment notes that groundwater may be contaminated outside that radius, but it does not estimate this quantity. Generally, only releases greater than 1,000 gallons are affected by this phenomenon, i.e., groundwater contamination is likely underestimated for the 5,000 gallon, 100-year release scenario.

[65] The release volume data used in the groundwater protection assessment differs from the data used to calculate product loss and may lead to apparent inconsistencies. For instance, under the Preferred Option, prevention of 1.2 million gallons of product loss over 2,200 releases implies an average of over 500 gallons per release; however, in the groundwater protection analysis, EPA relies on estimates of groundwater contaminated based on releases of 50 gallons for the following two reasons: (1) the volumes of product loss based on Florida data are based on actual data, while the risk analysis relies on a simulation; and (2) the simulation assumes that product is released over a relatively short period of time (approximately one month), which likely overstates the effect of groundwater contamination for any given volume. Given these circumstances, EPA selected an average release volume to characterize groundwater contamination that is significantly lower than the volume implied by the analysis of product loss, but which reduces the risk of overstating positive impacts from groundwater protection.

Exhibit 4-18

Volume Of Groundwater Protected			
Release time to discovery and volume * (average groundwater volume contaminated)	**Preferred Option (billion gal. per year)**	**Alternative 1 (billion gal. per year)**	**Alternative 2 (billion gal. per year)**
Total releases	1,680 - 5,370	1,820 - 5,780	630 - 3,860
1 year until discovery, 10 gal. release (*24,068,183 gal. GW contaminated)*	40 - 130	44 - 140	15 - 93
1 year until discovery, 50 gal. release (*48,785,436 gal. GW contaminated)*	82 - 260	89 - 280	31 - 190
5 years until discovery, 50 gal. release *(80,192,581 gal. GW contaminated)*	130 - 430	150 - 460	51 - 310
100 year until discovery, 5,000 gal. release (*1,056,971,192 gal. GW contaminated)*	1,800 - 5,700	1,900 - 6,100	670 – 4,100
Primary estimate (average of 50 gal. release over 1 and 5 years)	**110 - 350**	**120 - 370**	**41 - 250**

*Average groundwater volume contaminated per release based on RTI International, "Risk Analysis to Support Potential Revisions to Underground Storage Tank (UST) Regulations," December 22, 2010.

Under the alternative baseline, assuming that 50 gallon releases and one- to five-year time frames represent the average parameters of avoided releases, approximately 65 to 210 billion gallons of groundwater would be protected annually in the Preferred Option. See **Exhibit 4-20** for a full accounting of avoided costs in the alternative baseline.

4.11 Conclusion

Exhibit 4-19 summarizes the monetized avoided costs and benefits due to the proposed rule. In total, EPA estimates approximately $300 million to $740 million in costs will be avoided as a consequence of the Preferred Option. In addition, the proposed rule will generate modest benefits due to avoided cancer risks. Although their value cannot be reliably monetized, roughly 110 billion to 350 billion gallons of groundwater per year will avoid contamination due to new requirements. Finally, the proposed rule will generate ecological benefits and reductions in nonbenzene morbidity and mortality risks that we could not quantify in our analysis.

Exhibit 4-19

Summary Of Positive Impacts[d]			
Type of Impact	**Preferred Option**	**Alternative 1**	**Alternative 2**
Monetized Benefits ($ millions, present value 2008$)			
Avoided cancer risks[a]	$0.001 - $0.005	$0.002 - $0.005	$0.001 - $0.003
Monetized Avoided Costs ($ millions, present value 2008$)			
Releases and groundwater incidents	$300 - $700	$300 - $740	$110 - $570
Vapor intrusion	$0.4 - $26	$0.5 - $28	$0.2 - $19
Product loss	$2.0 - $7.2	$2.6 - $7.6	$0.4 - $5.3
Total[b]	$300 - $740	$310 - $770	$110 - $590
Nonmonetized Impacts[c]			
Groundwater protected (billion gallons)	110 - 350	120 - 370	41 - 250
Acute events and large-scale releases (e.g., releases from AHFDSs and FCTs)	Not estimated	Not estimated	Not estimated
Ecological benefits	Not estimated	Not estimated	Not estimated
Nonbenzene human health risks	Not estimated	Not estimated	Not estimated

[a] The pathway assessed to evaluate avoided cancer risk is benzene exposure through contaminated groundwater.
[b] Avoided cancer risks and avoided costs are separate and additive (i.e., these estimates do not overlap). Avoided cancer risks are the benefits associated with reducing cancer cases prior to discovery of the release. Avoided remediation costs from releases and groundwater incidents are the costs related to site remediation. Avoided vapor intrusion costs include additional avoided costs associated with the remediation of vapor intrusion cases; the RIA does not address human health risk associated with vapor intrusion. Avoided product loss costs are also separate and additive.
[c] Due to data and resource constraints, EPA was unable to monetize some of the positive impacts of the proposed rule. Chapter 4 provides a qualitative discussion of these benefits.
[d] Totals may not add up due to rounding. Cost estimates were derived using a seven percent discount rate.

4.11.1 Summary of Positive Impacts under the Alternative Baseline Scenario

Exhibit 4-20 summarizes the monetized avoided costs and benefits due to the proposed rule under the alternative baseline. In total, EPA estimates approximately $180 million to $440 million in costs will be avoided as a consequence of the Preferred Option under the alternative baseline. The proposed rule will also generate modest benefits due to avoided cancer risks. Approximately 65 billion to 210 billion gallons of groundwater per year will avoid contamination due to the proposed requirements in the Preferred Option. Overall, positive impacts under the alternative baseline are roughly 60 percent of positive impacts when the original baseline is assumed.

Exhibit 4-20

Summary Of Positive Impacts Using Alternative Baseline[d]

Type of Impact	Preferred Option	Alternative 1	Alternative 2
Monetized Benefits ($ millions, present value 2008$)			
Avoided cancer risks[a]	$0.001 - $0.003	$0.001 - $0.003	$0.0003 - $0.002
Monetized Avoided Costs ($ millions, present value 2008$)			
Releases and groundwater incidents	$180 - $420	$180 - $440	$64 - $340
Vapor intrusion, average	$0.3 - $16	$0.3 - $17	$0.1 - $11
Product loss	$1.2 - $4.3	$1.6 - $4.6	$0.2 - $3.2
Total[b]	$180 - $440	$180 - $460	$64 - $360
Nonmonetized Impacts[c]			
Groundwater protected (billion gallons)	65 - 210	71 - 220	25 - 150
Acute events and large-scale releases (e.g., releases from AHFDSs and FCTs)	Not estimated	Not estimated	Not estimated
Ecological benefits	Not estimated	Not estimated	Not estimated
Nonbenzene human health risks	Not estimated	Not estimated	Not estimated

[a] The pathway assessed to evaluate avoided cancer risk is benzene exposure through contaminated groundwater.
[b] Avoided cancer risks and avoided costs are separate and additive (i.e., these estimates do not overlap). Avoided cancer risks are the benefits associated with reducing cancer cases prior to discovery of the release. Avoided remediation costs from releases and groundwater incidents are the costs related to site remediation. Avoided vapor intrusion costs include additional avoided costs associated with the remediation of vapor intrusion cases; the RIA does not address human health risk associated with vapor intrusion. Avoided product loss costs are also separate and additive.
[c] Due to data and resource constraints, EPA was unable to monetize some of the positive impacts of the proposed rule. Chapter 4 provides a qualitative discussion of these benefits.
[d] Totals may not add up due to rounding. Cost estimates were derived using a seven percent discount rate.

Chapter 5. Distributional Impacts and Considerations

5.1 Introduction

This chapter considers specific impacts that may be created by the distribution of the costs and benefits of the proposed rule. EPA has undertaken several analyses to examine how the pattern of costs and benefits may affect specific populations and sectors of the economy. Specifically, the chapter considers:

- Economic impacts associated with the costs of the proposed rule: These could include changes in facility operation and closure of facilities due to cost increases under the regulation. In addition, the proposed rule may create negative and positive employment impacts, including both reductions in employment to reduce costs and increases in employment to ensure implementation of rule provisions. Finally, the proposed rule may affect public spending related to cleanup of contaminated sites.

- Energy impacts associated with the proposed rule: EPA considers the potential for this proposed rule to affect the supply, distribution, or use of energy, including changes in the price of fuel.

- Impacts on small business and governments: EPA's regulatory flexibility analysis considers the potential for rule-related costs to have a significant impact on a substantial number of small entities (SISNOSE).

- Impacts on minority and low-income populations: EPA considers the potential for the proposed rule to have disproportionate impacts on minority or low-income populations.

- Children's health impacts: EPA considers the potential for the proposed rule to have a significant or disproportionate impact on the health of children.

Note that the analyses in this chapter employ data and results from EPA's primary analysis assuming a constant number of tanks and releases over 20 years. This chapter does not consider impacts under the alternative baseline scenarios. In general, impacts under alternative baseline assumptions would be slightly smaller, reflecting the smaller universe of affected facilities over time.

5.2 Economic Impacts

In the context of regulatory analysis, an economic impact is an effect on the economic wellbeing, or welfare, of any stakeholder due to compliance with the proposed rule. Direct economic impacts can be borne by producers (i.e., those who produce, distribute, or sell products associated with the proposed rule), by consumers (i.e., those who purchase products associated with the proposed rule), or both.

The economic impacts of the proposed rule result from increases in compliance costs due to new regulation. In the short run, producers (i.e., owners or operators of facilities with UST systems) can respond to cost increases in one of two ways: by passing through some or all costs to customers (consumers) through increases in price, or by absorbing costs and reducing profitability. If producers cannot pass on to consumers any of their increased compliance costs, the proposed rule will chiefly affect producers in the short run, and economic impacts may include reduced profits, changes in operation, and in extreme cases, facility closure. If producers are able to increase prices on products to recover some or all compliance costs, the proposed rule will affect consumers by raising prices. The extent to which producers can pass through costs depends on the structure of the markets in which they operate.

As we discuss in subsequent sections, we do not believe that many firms will be able to pass increases in prices on to consumers through higher fuel prices. While local level motor fuel retail stations may face similar increases in costs of compliance, consumers' sensitivity to changes in gasoline prices provides a significant disincentive for station operators to increase fuel prices.[1] Instead, compliance costs are likely to be passed on through cross-marketed goods whose demand is less sensitive to changes in prices, such as items for sale at gas station convenience stores.

EPA's assessment of the economic impacts associated with this rule is presented as follows:

- **Distribution of affected facilities.** We first discuss the universe of affected facilities, with a focus on the retail motor fuels sector. This section also describes supply and demand dynamics within the retail motor fuels market and the likely economic responses to increased compliance costs.

- **Screening level economic impact analysis of average costs on facilities.** EPA presents a screening assessment of the impacts of average estimated facility-level costs on the facilities affected by the rule.

- **Sensitivity analysis of economic impacts.** To address uncertainty related to the distribution of costs among UST facilities, we present a "worst case" sensitivity analysis that identifies the maximum number of facilities that could face significant economic impacts due to regulatory costs. This section also briefly discusses implications for facility closures and changes in employment.

[1] A high degree of consumer sensitivity to changes in gasoline prices does not imply that prices are equal across gasoline stations in the same area. Factors that affect retail motor fuel prices at the station-level include traffic flows, population density, and intensity of local retail competition on the demand side, while supply can be affected by land cost, station setup, labor costs, and taxes. See p. 15 – 16, Fischer, Jeffrey. "The Economics of Price Zones and Territorial Restrictions in Gasoline Marketing," 2004, Federal Trade Commission, accessed at http://www.ftc.gov/be/workpapers/wp271.pdf

- **Impacts on public funding for cleanups.** The proposed rule is estimated to result in significant cost savings associated with avoided cleanup requirements as releases decline. A significant portion of cleanup costs are currently borne by the public sector, using taxes and fees to fund state cleanup efforts. EPA examines the potential reduction in public sector liabilities associated with the broader reduction in releases.

5.2.1 Distribution of UST Systems by Industry Sector

As shown in **Exhibit 2-3** in Chapter 2, the majority of UST systems are located at motor fuel retailers (i.e., gas stations). EPA estimates that, of the 611,449 UST systems active in 2009, 481,108 (roughly 80 percent) were located at approximately 162,000 motor fuel locations in the United States.[2] The remaining 130,341 (roughly 20 percent) of facilities are spread across several industries, including the commercial sector (wholesale, retail, accommodation, and food services), manufacturing, transportation, communications and utilities, and hospitals.[3] Notably, the sectors other than retail motor fuels are difficult to characterize with regard to UST systems; depending on their uses, UST systems may occur in varying numbers at facilities of varying size and purpose across all sectors. Only in the retail motor fuel sector do UST systems serve a similar, central function at virtually all facilities in the sector.

In addition to comprising 80 percent of all UST systems, establishments in the retail motor fuels sector also have the highest average number of UST systems per facility, with a facility average of 2.97 (roughly three systems per facility). In comparison, facilities in other sectors have, on average, between 1.47 and 2.30 systems.[4] Because many requirements in the proposed rule occur at the UST system level, establishments in the retail motor fuels sector have the highest average compliance costs per facility. In total, this sector is likely to bear roughly 70 percent of total costs associated with the proposed rule.[5]

Because the costs of the proposed rule will primarily affect the retail motor fuels sector, and because this sector is characterized by a large number of independently-owned facilities and companies, this economic impact analysis focuses on the retail motor fuels sector.

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[2] EPA's count of UST systems includes states and territories, while the estimate of retail motor fuel locations includes only facilities in the continental U.S., Hawaii, and Alaska. Because only 7,619 UST systems (approximately 1.1 percent) are located in other U.S territories, we use 162,000 facilities as the total population.

[3] See Chapter 2.1 for more detail.

[4] See **Exhibit 2-3**. For example, we calculate 2.30 systems per commercial facility by dividing 52,271 systems by 22,730 facilities.

[5] Total costs under the Preferred Option are $210 million, with $180 million directly related to conventional USTs and EGTs. Motor fuel retailers will bear approximately 80 percent of these $180 million in costs, which represent roughly 70 percent of total costs under the Preferred Option.

5.2.2 Market Dynamics in the Retail Motor Fuels Sector

This section provides an overview of the U.S. wholesale and retail motor fuels markets, including market concentration, fuel distribution practices, and the implications of market structure for pricing.

Supply-side Characteristics: Ability of Producers to Pass Through Costs

The North American Industrial Classification System (NAICS) code for retail motor fuel sales (i.e., gasoline stations) is 447, and specifically applies to retailers of automotive fuel and automotive oils. Establishments classified under NAICS code 447 include facilities with and without convenience stores, and all have specialized equipment for the storing and dispensing of automotive fuels.[6]

According to the 2002 Economic Census, average revenues for establishments in NAICS sector 447 were approximately $2.1 million. On average, each establishment employed approximately eight employees.[7]

Market Concentration

Market concentration is an indicator of the ability of firms to raise prices in response to changes in the costs of doing business: in markets with fewer, larger companies (i.e., highly concentrated markets), large firms typically have greater ability to pass through price increases to consumers. One indicator of market concentration is the proportion of total sales made by individual firms within a particular market. In markets where concentration is high, few firms earn a relatively large proportion of the total revenues in a market and are sometimes able to pass price increases through to consumers because of limited competition from smaller firms.

The retail motor fuels sector is representative of the broader retail sector in market concentration. Specifically, one-third of all sales made by NAICS sector 447 are made by establishments owned by the fifty largest firms in the sector, compared with 32 percent of sales to the largest 50 firms in the broader retail sector.[8] This level of market concentration does not suggest that retailers will easily pass through price increases.[9]

[6] 2002 Economic Census, Retail Trade, Industry series. Gasoline Stations: 2002. Issued November 14, 2004. Accessed online at: http://www.census.gov/epcd/www/concentration.html

[7] While EPA relies on 2002 Economic Census figures for values per facility, this analysis relies on more recent and focused National Petroleum News Survey values for a count of the number of facilities.

[8] 2002 Economic Census, *Retail Trade*, Industry series. Gasoline Stations: 2002. Issued November 14, 2004. Accessed online at: http://www.census.gov/prod/ec02/ec0244i14.pdf

[9] A common measure of market concentration can be obtained through the Herfindahl-Hirschman Index (“HHI”), which is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. For example, if only two firms operate in a market and each has 50 percent of sales, then the index would register $50^2 + 50^2 = 5{,}000$. The U.S. Department of Justice’s merger guidelines categorize markets in which HHI is between 1,000 and 1,800 points as moderately concentrated, and those in which the HHI is in excess of 1,800 points as concentrated. Because the four largest firms in NAICS sector 447 generate only eight percent of

Geographical Concentration

Gasoline stations are generally distributed across the United States in proportion to population. The most populous states have more establishments and higher proportions of gasoline sales.[10] While no data are available regarding the distribution of facilities by size, the retail gasoline market is relatively homogeneous nationwide, and it is likely that facilities of different sizes are distributed according to population as well.

Ownership Structure

The 2009 Gas Price Kit published by the National Association of Convenience Stores classifies motor fuel retailers into three broad categories, depending on the manner in which they obtain their wholesale product:[11]

- **Refinery-Owned:** Fewer than two percent of facilities are retail operations directly owned by large oil producers. These stations receive wholesale product directly from the oil company's refinery, and their profit is part of the oil company's profit. At these facilities, the parent corporation manages all aspects of the customer experience and establishes a consistent brand identity.

- **Branded Independent Retailers:** Approximately 55 percent of facilities are branded independent retailers. These facilities are owned by independent operators and contract with a refinery to sell a particular brand of gasoline. This owner leverages the supplier's marketing and ensures constant supply in exchange for a surcharge per gallon paid to the supplier. Branded retailers' contracts with refiners typically contain clauses that specify the margins retailers can charge above wholesale prices.

- **Unbranded Independent Retailers:** Approximately 45 percent of facilities are unbranded independent retailers. These retailers purchase gasoline on the open market, without committing to a particular supplier.

Wholesale gasoline is a commodity, but varies in price regionally based on a combination of refinery locations, specific fuel mixes (e.g., to meet air quality standards), and the type of distributors in a region. Types of wholesalers include:[12]

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the sales in that market, the HHI will be well below 1,000 for this sector. We conclude that firms' relatively small market share translates into weak pricing power. For additional information, see: http://www.justice.gov/atr/public/testimony/hhi.htm

[10] U.S. Census Bureau, Industry Statistics Sampler: NAICS 447, Geographic Distribution—Gasoline Stations: 1997. Accessed online at: http://www.census.gov/epcd/ec97/industry/E447.HTM

[11] National Association of Convenience Stores, 2009 NACS Gas Price Kit, http://www.nacsonline.com/NACS/Resources/campaigns/GasPrices_2009/Pages/HowRetailersGetSellGas.aspx

[12] Kleit, Andrew N., 2003. "The Economics of Gasoline Retailing Petroleum Distribution and Retailing Issues in the U.S."

- **Refinery-owned wholesalers**: Refiners (typically large oil companies) distribute directly to their own retail outlets in all regions, and in some areas may also distribute directly to independent branded and unbranded retailers (competing with other suppliers in the unbranded market).

- **Area Franchisees**: Otherwise known as "jobbers," these firms obtain the right from oil companies to franchise a brand of motor fuel in a particular area. Jobbers are responsible for siting and building new facilities and marketing the brand, which further removes refiners from operating activities. The term is also used to describe wholesale distributors of motor fuels that offer multiple brands.

While some regions have significant competition among distributors, the market power of refiners and the contract structure of many retailers means that retailers in general have little control over the price of their fuel supply.[13] As a consequence, any cost increases must be absorbed by retailers or passed through to customers.

Demand-side Characteristics: Consumer Response to Price Increases

Consumer reactions to price changes are critical in determining whether a producer (i.e., retailer) can pass on costs. The degree to which consumers change the quantity they consume when the price of a good increases is known as the price elasticity of demand. Economists define demand as inelastic if the quantity demanded changes less than price (e.g., quantity demanded changes by one percent when prices rise (or fall) by 1.4 percent). Similarly, demand is said to be elastic if quantity demanded changes proportionally more for a relative change in price.

Motor fuel retailers rely on sales of gasoline for most revenues, though most also sell other automobile-related or convenience products. Research has documented that broad (national) market demand for gasoline is relatively price-inelastic in the short-run: consumers do not make immediate, significant changes in gasoline purchases if prices increase.[14] On its face, this dynamic would suggest that a retailer could pass through any cost increases to consumers. However, the structure of the market for gasoline prohibits significant price fluctuations at the facility level. While national demand is relatively consistent, consumers are highly sensitive to price differences within local markets.[15] Small increases in price at one location can produce relatively large changes in quantity demanded for a particular facility as consumers seek other local retailers with lower costs.

[13] Other suppliers, e.g. for convenience store items, may be easier with which to negotiate but may not be available to all motor fuel retailers.

[14] Dahl, Carol and Thomas Sterner, 1991. "Analyzing Gasoline Demand Elasticities: A Survey," *Energy Economics*, July: p. 203 – 210.

[15] As noted above, a high degree of consumer sensitivity to changes in gasoline prices does not imply that prices are equal across gasoline stations in the same area. See: Fischer, Jeffrey. "The Economics of Price Zones and Territorial Restrictions in Gasoline Marketing," 2004, Federal Trade Commission, accessed at http://www.ftc.gov/be/workpapers/wp271.pdf

A recent National Association of Convenience Stores (NACS) survey provides insights into the price pressures faced by local retailers:[16]

- 73 percent of respondents stated that price was the most important factor in their gasoline-purchasing choices.

- 32 percent stated that they would take the time to make a left turn on a busy street to save a penny per gallon of gasoline.

- 20 percent said they would drive ten minutes out of their way (a 20-minute round trip plus cost of fuel) to save two cents per gallon. This amounts to savings of less than one dollar in terms of fuel for nearly all passenger vehicles on the road today.

Local competition for price-sensitive customers discourages retailers from increasing gasoline prices, except in cases such as wholesale price increases or tax increases where changes are uniform across facilities.[17] Because compliance costs may vary by facility depending on existing technology and practice, it is not likely that retailers will opt to pass through compliance costs by raising gasoline prices. While retailers may be able to increase the prices of other products (e.g., motor oil or convenience store products), it is also likely that some retailers will be forced to absorb some or all of the costs associated with the regulation.

Retailers in relative isolation may be better positioned to pass on increases in cost to consumers. Research shows that store-level pricing is sensitive to the concentration of competition. In areas where motor fuel retailers are relatively sparse, facilities may be better able to pass cost increases on to consumers, for whom the opportunity cost of finding an alternative store is higher when they must travel farther.[18]

However, because consumers are especially price sensitive about gasoline and it is not clear what other options owners or operators have to increase prices, we assume that owners or operators will likely bear the economic impacts of the rule. We therefore examine producer impacts, including the possibility that some facilities may close due to cost increases.[19]

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[16] National Association of Convenience Stores, "Consumer Fuels Report," February 2008, as cited in "Testimony of Bill Douglass, Douglass Distributing Company, on behalf of The National Association of Convenience Stores before the House Judiciary Committee, Anti-Trust Task Force Hearing to Examine the Consumer Effects of Rising Gas Prices," May 7, 2008.

[17] This may vary, depending on the region. For example, in Vancouver, gasoline prices are uniform and rigid (due to tacit collusion among wholesalers), while prices in Ottawa are dispersed and volatile (due to the price-disrupting behavior of "maverick" firms). See Eckert, Andrew and Douglas S. West, "A tale of two cities: Price uniformity and price volatility in gasoline retailing, "2003, *The Annals of Regional* Science 38:25–46.

[18] See Hoch *et al.*, 1995. "Determinants of Store-level Price Elasticity," *Journal of Marketing Research*, Vol. 32 (1): p. 17 – 29.

[19] A more detailed analysis of consumer impacts is prohibitively difficult for two reasons. First, the precise set of goods and services whose prices may increase is difficult to characterize. Second, gasoline aside, the main draw to products sold at retail motor fuel facilities is convenience, i.e., ease of access. Most non-fuel products can be purchased for lower prices at grocery stores, for example. Consumers can therefore shop at other types of

5.2.3 Assessment of Market Exits and Employment Impacts

In a market setting where producers cannot reliably pass through costs, the most significant economic impacts are related to reduced facility profits. In some cases, managers can cut supply or employment costs (this could result in smaller worker paychecks). In cases where costs exceed facility profits, it is likely that in the long term a facility would exit the market. A critical factor, therefore, is an estimate of average firm or facility profits.

It is difficult to estimate the profitability of retail motor fuel stations because many are small and privately held and are not required to report profits publicly. However, some evidence suggests that profit margins are below five percent, and data suggest that average after-tax profit margins reported to the IRS for gas stations are roughly 1.5 percent.[20] Holding all other things equal, an annual cost greater than 1.5 percent of gross sales (i.e., a cost greater than $1,500 for a firm earning $100,000 a year) would exceed average reported profits and would therefore cause a motor fuel retailer to operate at a loss. If the facility cannot adjust its prices or lower costs, it will eventually exit the market.[21]

Consistent with the assessment of small business impacts in Section 5.4 of this chapter, EPA considers the impact of the proposed rule on small facilities in order to identify the most likely facilities to exit the market. Assuming that all motor retail facilities, regardless of income, have an "average" configuration of approximately three tanks, EPA calculates the average total cost per facility to be $892 under the Preferred Option (reflecting a cost of approximately $300 per UST system).[22,23]

Using data from the 2002 Economic Census and the regulatory flexibility screening analysis methodology, EPA concludes that a facility-level cost of $892 would exceed 1.5 percent

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facilities for the same goods, but typically opt to pay a premium for purchases at a convenient location. Note that, even though consumers will be able to purchase equivalent goods at different locations, there is a reduction in consumer surplus associated with the loss of convenience in the purchase.

[20] For corporations reporting net income, profit margins before non-cash items (depreciation and amortization) and income tax (or credits) were approximately 1.8 percent. Earnings before depreciation and amortization account for the fact that firms can postpone capital expenditures to save cash, and would likely do so while adapting to higher costs. If non-cash items and taxes are included, earnings drop to roughly one percent. Our approach averages of the two options, reflecting an assumption that firms will do something to adapt to higher costs while they sort out how to adjust prices, and that firms typically minimize profits reported to the IRS. See SOI TaxStats, Table 7: Corporation Returns with Net Income for 2007, accessed at http://www.irs.gov/taxstats/article/0,,id=170693,00.html. See also 2002 - 2010 RMA *Statement Studies*, Sector 447, for a range of profitability data from facilities of different sizes.

[21] Throughout this chapter, EPA refers interchangeably to reductions in net profit and the proportion of revenues that the costs of the proposed rule will create. In both cases, we refer to the impact of the cost of the proposed rule on the profitability of a facility.

[22] Specifically, we assume 2.97 UST systems per facility.

[23] Under Alternative 1 the average retail motor fuel facility cost would be $1,801, and under Alternative 2 it would be $613. In Indian country, where facilities are required to meet more requirements than elsewhere; average cost per facility is $2,364 under the Preferred Option, $3,333 under Alternative 1, and $1,999 under Alternative 2.

of total reported revenues (i.e., be equal to or greater than total profits) for 561 firms, representing less than one percent of the universe of motor fuel retail facilities.[24] In comparison, approximately 2,400 facilities per year closed over the period between 2005 and 2008.[25,26] In some cases, any exits related to regulatory costs may coincide with exits that would have occurred in the baseline. Furthermore, it is likely that many of the affected facilities will also have options to pass through at least a portion of costs, and many small facilities may have fewer than three UST systems. Therefore, EPA concludes that the market impacts associated with this proposed rule are likely to be diffuse and minimal, assuming a relatively uniform distribution of costs nationwide.

Sensitivity Analysis

EPA's finding of minimal market impacts rests on an assessment of "average" facilities with "average" rule-related costs. If the costs of the proposed rule are concentrated on certain facilities, it is possible that additional impacts (e.g., market exits) could occur. EPA therefore employs several sensitivity analyses to consider alternative, "worst case" distributions of regulatory costs across facilities.

To examine the extent to which the distribution of regulatory costs can be "concentrated" on specific facilities, EPA constructs a "worst case distribution" in which regulatory costs are concentrated on a subset of facilities.[27] To obtain this distribution, we artificially assign costs to create the largest cost for the largest number of facilities, by assuming that the same facilities in

[24] An analogous statement of this outcome is that all facilities with revenues below approximately $59,500 per year would incur new costs equal to or in excess of profits of 1.5 percent of total revenue. Note that U.S. Census data indicate that all firms in the motor fuel sector that earn less than $59,500 are single-location firms.

[25] NPN reported a station count of 161,768 in 2008, compared with 168,987 in 2005. These figures imply a decrease of approximately 2,400 stations, or 1.4 percent, per year. See *National Petroleum News*, "MarketFacts 2008," and NPN MarketPulse, "2005 U.S. motor fuel station count: 168,987," both accessed at http://www.npnweb.com/.

[26] There is a significant discrepancy between the number of establishments reported by the 2007 Economic Census by the U.S. Census Bureau and the 2008 station count published by National Petroleum News. The Census reported 118,756 stations operating in any capacity, while NPN counted 161,768 stations. EPA contacted the Census Bureau, which offered three possible reasons for this discrepancy. First, grocery stores with gas stations and wholesale truck stops with gas stations may be categorized under grocery stores or wholesale retail instead of gas stations. Second, the count reported by the Census excludes non-employer establishments (10,131), which are family-owned and only employ family members. Third, for those establishments that do not report back to the Census regularly, the Bureau is not likely to record changes in establishments that have happened at the location (personal communication with the Office of Underground Storage Tanks, November 3, 2010). NPN likely provides a more accurate reflection of the number of stations because it is an industry publication specific to the petroleum sector.

[27] Ideally, EPA would evaluate which facilities are likely to incur significant impacts by examining the specific changes each will be required to make to achieve compliance. These costs would be compared with the facility's revenue and profit margin to establish whether it can incur the additional costs and remain in business. To EPA's knowledge, no data of this resolution are available for the large population of facilities with UST systems.

the state make every regulatory change.[28] We further assume that the smallest facilities in the U.S. are the facilities that bear the highest cost.[29]

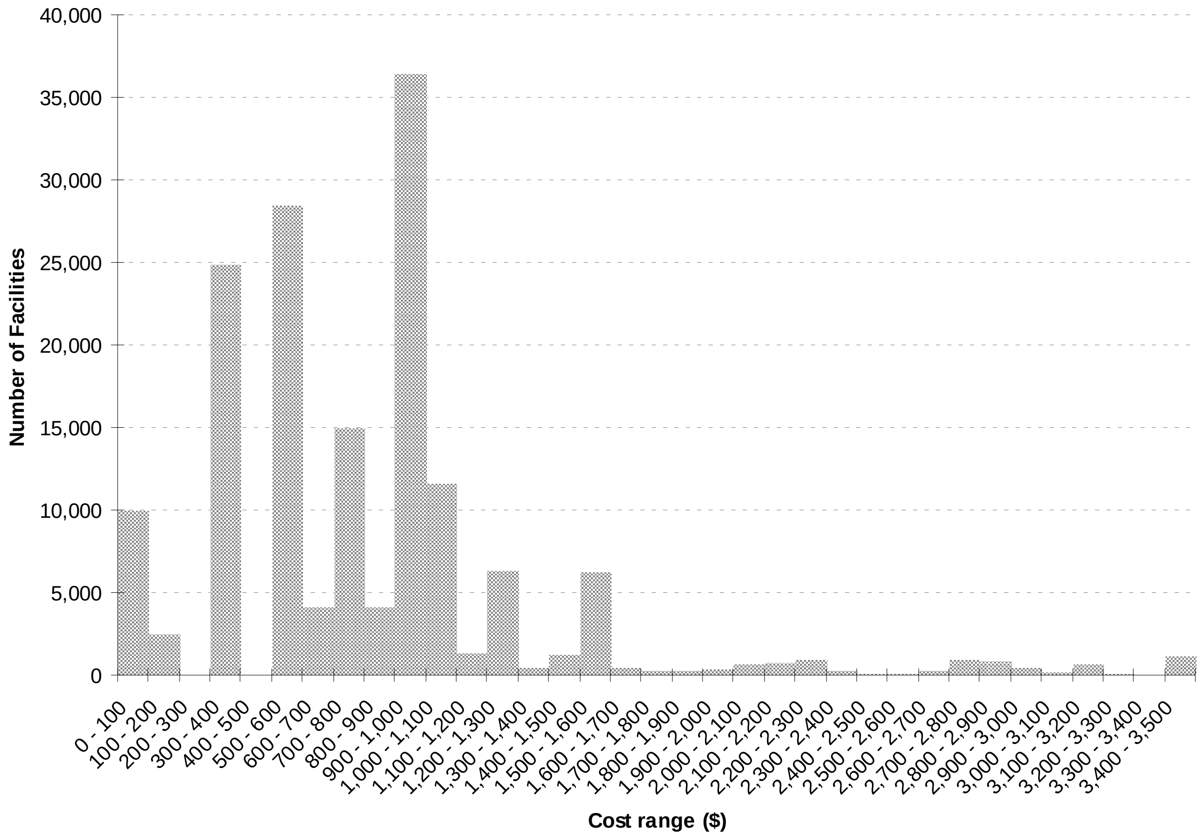
Exhibit 5-1 displays the universe of retail motor fuel UST facilities in the United States when costs are allocated to concentrate impacts. This creates an allocation of costs that varies broadly, from as little as $30 to just over $3,400 per facility.

[28] For example, consider a state with 1,000 UST facilities that will be subject to three hypothetical technical requirements: Requirement A will affect 500 facilities and cost $50 per facility; Requirement B will affect 250 facilities and cost $100 per facility; and Requirement C will affect 100 facilities and cost $200 per facility. The average cost for all of these facilities is $70 (((50*500) + (250*100) + (100*200))/1000). However, the highest cost possible in this state is $350 (costs of $50 from Requirement A, $100 from Requirement B, and $200 from Requirement C), and the largest number of facilities that could incur this cost is 100 (the smallest of the universes affected by Requirements A, B, or C). The next highest cost is $150 (costs of $100 from Requirement B and $50 from Requirement A), which affect 150 facilities, excluding those also affected by Requirement C. The last group would be affected only by Requirement C, with 250 facilities at a cost of $50 per facility. Such an allocation of costs creates an unlikely outcome with a high potential for market exits. Appendix K provides the detailed summary of this threshold calculation.

[29] EPA also examined a sensitivity analysis that would specifically consider the effects of "front-loading" capital cost requirements, but this scenario would have no effect on the results of the "worst case" sensitivity analysis. The “worst case” scenario examined here already assumes simultaneous implementation of all requirements under the proposed rule, including several that actually have delayed implementation schedule (e.g., interstitial integrity tests). In addition, the analysis includes annualized costs for capital requirements for Indian country systems (e.g., secondary containment). The “worst case” scenario does not address the replacement of closure of lined tanks that cannot be repaired according to a code of practice, and does not assume that full capital costs are incurred in a single year for affected tanks, but the facilities that would be affected by these changes are already among the highest cost facilities identified, and are already therefore included in the number of facilities potentially affected under this worst-case assumption.

Exhibit 5-1

Distribution Of Retail Motor Fuel UST Facility Costs
Using “Worst Case” Distribution



One possible concern is whether facilities that are likely to face high costs are geographically concentrated in certain states or regions. To assess this, we examined the distribution of the five percent of facilities incurring the highest costs if costs were concentrated (specifically, 8,135 facilities incurring costs greater than $1,800). The proportion of highest-cost facilities does not vary substantially by state. The highest concentration of high-cost facilities would be 6.4 percent (in Guam); 53 of the remaining 56 states and territories (accounting for 91 percent of retail motor fuel facilities) have roughly 5.0 percent to 6.5 percent of their facilities with this cost (OR, CA, and MS have fewer than four percent high-cost facilities). Differential economic impacts across states are not likely to occur as a result of disproportionate state-level impacts from this rule, even in a scenario of maximum concentration of costs across the fewest firms.

To assess economic impacts in this worst case scenario, EPA pairs the distributions of facility size and costs to identify situations in which estimated costs would exceed 1.5 percent of gross sales (the average reported retail motor fuel facility profit). Facilities with costs exceeding 1.5 percent of revenues may face a significant economic impact under worst case assumptions.

Market Exits

Even under the adverse scenario presented above, economic impacts to affected entities are relatively small. The least compliant facilities in the least regulated states would incur costs of $3,415 in the worst case.[30] This represents less than 1.5 percent of revenues for facilities earning more than $228,000 per year. To assess the worst-case potential impact, EPA assumed that the facilities with the highest costs (those in the right-hand tail of the distribution in **Exhibit 5-1**) are also the facilities with the lowest revenues and allocated costs to those facilities to maximize the number of potential exits. EPA estimates that 6,100 facilities earning less than $250,000 per year in the U.S. (in 2002 dollars) would be subject to costs exceeding 1.5 percent of revenues in the worst case scenario.[31] To the extent that those facilities could not increase prices to offset higher costs, it is likely that at least some of them would exit the market. If all of these facilities exited the market, the closures would constitute roughly four percent of existing facilities. Note that this scenario relies on a highly unlikely confluence of assumptions, including:

- **All facilities with income less than $250,000 have average configurations of three UST systems.** In fact, it is likely that small facilities have fewer than three tanks and would therefore not be subject to the facility-level costs estimated here It is likely that the smallest facilities also operate only a single UST system, which would reduce their compliance costs by approximately 67 percent.[32] Under such circumstances, most small operators would not be subject to a significant economic impact even in the worst-case scenario.

- **No facility has any option to increase prices on goods or services or to identify options for savings.** While gasoline prices are unlikely to rise in response to this proposed rule, consumers may be willing to pay marginal cost increases on other products and services. Moreover, in remote rural areas, retailers may be able to directly pass costs on to consumers.

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[30] Facility costs of roughly $3,400 or less are representative of approximately 99 percent of worst-case, high-end cost outcomes. Facilities in Indian country are the only exception, as they will also be required to comply with additional regulations for operator training and secondary containment. Because this group of facilities represents only roughly one percent of facilities with costs at or above $3,400, we do not present them as the main highest-cost scenario.

[31] The U.S. Census identified 5,142 facilities that earned less than $250,000 in 2002. For the purposes of its SBA analysis, EPA revised this estimate upward by 46 percent to reconcile disparities between Census gas stations counts from 2002 and NACS gas station counts from 2008. Of the estimated 7,520 facilities earning less than $250,000 per year in 2002, we arrayed the highest cost facilities with the highest revenue facilities, to ensure an estimate of as many exits as possible. See Appendix K for a detailed explanation of our methods.

[32] According to the 2009 NACS Convenience Store Industry Fact Book, the average motor fuel retailing facility has monthly throughput of approximately 118,500 gallons. As discussed in Chapter 2, we believe that the average motor fuel retailer operates approximately 3 UST systems. This equates to roughly 39,500 gallons of monthly throughput per system. In addition, based on information from a mid-size retail fuel marketer, EPA believes that a facility requires a minimum throughput of approximately 30,000 gallons per month to remain economically viable, which equates to upward of $50,000 in revenues per month given gasoline prices in excess of $2.00 since 2005. See http://www.eia.gov/dnav/pet/pet_pri_gnd_a_epmr_pte_dpgal_a.htm.

- **A profit margin of 1.5 percent is standard.** Companies have a clear incentive to minimize taxable profits when filing income taxes with the IRS. Because net income (profit) is taxable, corporations that are not publicly traded typically take legitimate steps (e.g., year-end investments in equipment, employee bonuses) to reduce both net income and tax burdens. As a result, a 1.5 percent after-tax profit estimate based on IRS data is likely to understate average profitability.

Finally, this analysis does not adjust the Census data on facility revenues for inflation, though costs are presented in 2008 dollars. Due to the variability of gasoline pricing, we adopt a conservative assumption that revenues have remained static in nominal terms since 2002.

While our sensitivity analysis suggests that just over 6,100 facilities may be at risk of significant economic impacts in a worst case scenario, it is unlikely that a significant number of actual market exits would result from the proposed regulation. A plausible exception to this finding exists in cases where a facility with high upgrade costs faces high levels of local competition. Even in these cases, closures would likely be consistent with the recent rate of industry consolidation of 1.4 percent per year.

Price Impacts

The high sensitivity of local demand to changes in retail motor fuel prices makes it unlikely that firms will react to the proposed rule by raising gasoline prices, However, the cost of other goods and services could potentially increase as firms seek to offset regulatory costs through sales of other products. Retailers will likely increase the prices of goods that are relatively price inelastic, such as tobacco products, auto service charges, or snack food and other convenience items.

Employment Impacts

The increased operating costs incurred by facilities to comply with this proposed rule may result in very slightly increased prices for their goods and services, as previously discussed. These potential price increases may result in reduced demand and thus reduced output of the facilities' goods and services. This could translate into lower demand for labor, a result commonly referred to as the demand effect. As discussed earlier, the price effect is expected to be small though, and given the relatively inelastic demand for gasoline, the demand effect is likely to be small as well. There is also the potential for the proposed rule to result in a small number of facilities exiting the market, which could result in a temporary negative employment effect as these workers look for other positions. However, as noted earlier and in the next section below, these exits may coincide with exits that would already occur in the baseline.[33] In addition, given the competitive nature of the retail motor fuel sector and the similar regulatory costs faced by each facility, many of these facilities may be able to pass through at least a portion

[33] See footnote 25.

of these costs (see Price Impacts section above).[34] As a result, the potential employment effect of market exits from the proposed rule is likely small.

Furthermore, some of the requirements of the proposed rule may have a positive impact on employment. For example, walkthrough inspections require labor as a primary input which may lead to small increases in employment at regulated facilities.[35] In addition, the increased demand for testing services and training under the proposed rule may also lead to increased demand for labor. Since the proposed rule could potentially affect the demand for labor both positively and negatively, the overall direction of net employment impacts is unclear, but is most likely very small relative to the size of the industry.

Long-run Economic Impacts

The proposed rule is unlikely to generate substantial additional impacts in the long run, but in a worst-case scenario it could accelerate ongoing consolidation trends in the retail motor fuel sector if market exits result. NPN reports that 168,987 motor fuel stations operated in the United States in 2005. By 2008, this number had fallen to 161,768, a decrease of 4.3 percent compared with 2005, or approximately 1.4 percent per year.[36] While broader market consolidation is related to ownership strategies among oil companies and general economic patterns, facilities facing significant periodic costs (e.g. UST system replacement) may be most likely to close. Similarly, facilities with higher operating costs as a result of the rule may opt to close. In such cases, exits caused by the rule are likely to affect the most marginal firms and would likely coincide to some extent with exits that would have occurred in the absence of the proposed rule. These closures will occur in the context of the national decline in the number of facilities, such that the rule is unlikely to cause a significant number of closures beyond those that will occur as part of the existing trend.

5.2.4 Assessment of Public Sector Cost Savings Related to Avoided Releases

A significant positive effect of the proposed rule derives from its impact on state funds created for the purpose of providing a financial responsibility mechanism to UST owners and operators. Among 56 state and territory governments, 43 have an existing fund created for the purpose of remediating releases; of these, 36 are active and continue to accept claims.[37] In many of these states, owners and operators are required to pay for a portion of remedial actions through

[34] Note that small marginal facilities are also likely to have fewer than three UST systems and thus face lower than average facility-level compliance costs.

[35] For example, EPA estimates that monthly walkthrough inspections of a facility will take nearly an hour to complete, on average. A compliant owner or operator in a state that does not currently have this requirement will need to allocate 12 man-hours of incremental effort per year to satisfy this portion of the proposed rule.

[36] See footnote 25.

[37] U.S. EPA, "Status of State Fund Programs," accessed September 9, 2010 at http://www.epa.gov/oust/states/fndstatus.htm

deductibles that generally range from zero to $100,000.[38] Given an average cost of remediation of $127,216 in 2009, however, state funds are frequently required to finance some portion of remediation costs.[39] These state funds are created by state legislation and must be submitted to EPA for approval before they can be used as financial responsibility mechanisms. In most cases, states generate money for their funds by levying tank registration and petroleum fees, which are then used to provide payments for remediation of releases beyond the deductibles paid by responsible parties. In states where funds rely on gas taxes and accept claims related to releases, these expenditures represent subsidies from the public to owners or operators responsible for releases.

The extent to which the proposed regulations reduce the occurrence of new releases produces two welcome effects:

- **Assignment of costs**. Fewer releases implies lower expenditures from state funds. This represents a reduction in this public subsidy and a reassignment of costs from the public remediation costs to private entity prevention costs. This improves market signaling and efficiency by requiring owners and operators to focus on release prevention.

- **Competitive effects**. High-performing owners or operators are less likely to incur significant regulatory costs than low-performing owners or operators. As a result, the regulatory costs and cost savings improve the alignment of incentives to focus on private-sector prevention costs and reduce public-sector remediation costs.

To illustrate the potential magnitude of the public expenditures that could be affected by the regulation (i.e., distributional effects), we examine states that have active state funds and categorize them into those that finance their funds via petroleum and tank fees ("Tier 1"), or via only a tank fee ("Tier 2").[40]

We assume that states that are required to comply with a larger number of the new requirements will experience a greater reduction of releases, all other things equal. To estimate the distribution of avoided releases, we calculate the average number of requirements with which

[38] Association of State and Territorial Solid Waste Management Officials, State Fund Survey Results 2009, Table 1: Design Characteristics of State Financial Assurance Funds, accessed at http://astswmo.org/files/publications/tanks/2009StateFundSurvey/2009-Table_1-Design-Characteristics-of-St-Financial-Assurance-Funds.pdf.

[39] Association of State and Territorial Solid Waste Management Officials, State Fund Survey Results 2009, Summary of State Fund Survey Results, accessed at: http://astswmo.org/files/publications/tanks/2009StateFundSurvey/2009-Summary.pdf. For example, representatives of the state of New Hampshire indicated that in most cases, the State Fund incurs remediation costs, except that the owner or operator typically bears the cost of immediately stopping the leak. In addition, New Hampshire indicated the owner or operator typically pays a $5,000 deductible towards the final remediation cost, and in New Mexico, the owner or operator typically pays a deductible between $0 and $10,000.

[40] States with active financial assurance funds can be found at http://www.epa.gov/OUST/states/fndstatus.htm

the systems in each state will need to comply. [41] We assign avoided releases based on both the number of systems in a state and the average number of requirements on each system, and we value releases based on the national profile of avoided releases and avoided groundwater incidents.[42] Using ASTSWMO data, we subtract from our estimate of the potential cost borne by the public the deductible that owners or operators would be expected to pay.[43] See Appendix N for a discussion of the methodology used.

Exhibit 5-2 presents the results of our screening-level assessment. Among the 36 states with active state funds that fall into Tier 1 or Tier 2, we find that the potential reduction in public expenditures could reach $191 million to $431 under the Preferred Option, with $150 million to $338 million in Tier 1 and $41 million to $94 million in Tier 2.[44] Reductions in public expenditures would equal approximately $198 million to $457 million under Alternative 1 and $80 million to $340 million under Alternative 2. These savings would be slightly lower in a scenario where deductibles are in the upper end of their ranges. We note that, to realize the savings in public expenditures, state government action would be required to lower petroleum fees. Alternatively, the extent that funds are not constrained in their use, a redistribution of funds (e.g., to backlog sites awaiting cleanup) could also represent a significant public benefit. The values presented in this table do not reflect discounting to account for regulatory compliance schedules.

Note that this screening-level analysis is intended only to identify the potential magnitude of impacts on state fund liabilities. A more detailed analysis of specific state program costs and the likely distribution of avoided releases would be necessary to precisely measure potential savings. Overall, the values in **Exhibit 5-2** suggest that requiring owners and operators to focus on prevention reduces costs to state financial assurance funds by over $150 million under the Preferred Option and Alternative 1 and upward of $50 million for Alternative 2.

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[41] We use the number of times a system is affected rather than the actual number of systems affected because we lack the data to determine which units are affected by each requirement. For example, if two requirements each affect 1,000 and 500 units, respectively, they may ultimately affect between 1,000 and 1,500 units, depending upon whether any overlap exists among the two regulated universes.

[42] We calculate this as avoided costs due to avoided releases divided by number of releases avoided. The procedure is similar for avoided groundwater remediation costs.

[43] We rely on the ASTSWMO Fund Survey Results 2008 for the data that underlie our construction of tiers. These data are available at http://www.astswmo.org/publications_tanks.htm.

[44] Due to our calculation methods, two states with very high deductibles (Minnesota and Virginia) showed deductible amounts and avoided releases that exceed their estimated avoided release costs. We exclude them from our calculations, such that our estimates for likely underestimate the potential for redistributive effects.

Exhibit 5-2

Summary Of State Financial Assurance Fund Distributional Effects

Fund Revenue Mechanisms	Preferred Option ($ millions)	Alternative 1 ($ millions)	Alternative 2 ($ millions)
Low deductible scenario (High distributional effects)			
Tier 1 (petroleum & tank fee)	$150 - $338	$154 - $355	$53 - $275
Tier 2 (tank fee only)	$41 - $94	$44 - $102	$27 - $65
Total	**$191 - $432**	**$198 - $457**	**$80 -$340**
High deductible scenario (Low distributional effects)			
Tier 1 (petroleum & tank fee)	$138 - $303	$142 - $318	$49 - $120
Tier 2 (tank fee only)	$39 - $87	$42 - $95	$14 - $71
Total	**$177 - $390**	**$184 - $413**	**$63 - $191**

5.2.5 Economic Impact Summary

This set of analyses shows that it is unlikely that the proposed rule will have substantial negative economic impacts on the regulated community, in part because the costs of the rule appear to be evenly distributed across a large population of facilities, and remain modest at the facility level. Even under a highly improbable worst case scenario in which the highest costs are incurred by the smallest facilities, roughly four percent of the universe of retail motor fuel facilities would potentially incur costs greater than publicly reported industry average profit margins. Market exits of roughly 2,400 facilities annually represent the current market trend. It is likely, therefore, that most or all market exits under this proposed rule would coincide with exits of specific out-of-date facilities that are on the brink of exiting, and would not create a significant additional contraction of the total market.

A more likely response by many affected firms will be to adapt by increasing prices on higher margin products and services. While overall employment impacts are unclear, it is possible that there may be an increase in labor demand due to the additional requirements placed on owners and operators, and additional demand for third-party testing services.

In addition, it appears that the proposed rule could have a positive impact on state governments that currently fund a portion of UST-related remediation costs through gasoline taxes and fees. A decrease in the number and severity of releases represents cost savings to states due to decreased demand on state financial assurance funds. Our initial screening assessment suggests that annual costs to states could be reduced by over $150 million. This represents a reduction in a public subsidy and an improvement in market signaling.

5.3 Energy Impact Analysis

Executive Order 13211, “Actions Concerning Regulations that Affect Energy Supply, Distribution, or Use” (May 18, 2001), addresses the need for regulators to consider the potential energy impacts of the proposed rule and resulting actions. Under Executive Order 13211, agencies are required to prepare a Statement of Energy Effects when a regulatory action may have significant adverse effects on energy supply, distribution, or use, including impacts on price and foreign supplies. Additionally, the requirements obligate agencies to consider reasonable alternatives to regulatory actions with adverse effects and the impacts that such alternatives might have on energy supply, distribution, or use.

The proposed rule affects underground storage tanks used in the storage of motor fuel or emergency generator fuel. However, it is not likely that this proposed rule will have significant impacts on energy supply, distribution, or use. To assess the energy impacts of the proposed rule, EPA considers potential changes in energy supply and use associated with the total costs estimated in Chapter 3. The following summarizes EPA's assessment of the energy impacts that the proposed rule will have in energy supply, distribution, and use.

Energy Supply and Distribution

The proposed rule consists of additional regulatory requirements that apply to the owners and operators of underground storage tanks. To the extent that the proposed rule affects the motor fuel sector, it does so at the retail motor fuel sales level, rather than the level of refineries or distributors who supply the retail stations with motor fuel. Correspondingly, we do not expect the proposed rule to have any impacts on energy supply or distribution.

In terms of local motor fuel availability, we believe two outcomes are possible. If a motor fuel station is located in an area where competition from other stations exists, we do not believe fuel prices will be affected. Rather, owners and operators will seek to recover the costs of the proposed rule by increasing the prices of convenience items. If a station does not also operate a convenience store through which it can recover these costs, it may become subject to a significant economic impact and exit the market. In such a case, however, supply will not be disrupted, as other competitors fill the void left by the former market participant.

We do not expect market exits to occur in low-competition environments due to the market power of stations and the marginal nature of the increase in cost. If a motor fuel station is located in an area where competition is not intense (e.g., a rural setting), it may opt to directly pass on higher costs through increases in fuel or convenience goods prices. As we discuss below, even if the entire cost of the rule is priced through to consumers, the change in fuel prices is not likely to be measurable.

Energy Use

The additional regulatory requirements contained in the proposed rule may increase compliance costs for owners and operators of retail motor fuel stations. If the owners and operators of retail motor fuel stations affected by the proposed rule can successfully pass through their increased compliance costs, energy use may be affected through higher energy prices caused by the proposed rule. However, we do not expect a significant change in retail gasoline prices to result from this proposed rule for the follow reasons:

- Economic analyses of retail fuel prices have revealed that demand for gasoline is highly sensitive to price (elastic) within localized geographic areas.

- As a result, if one motor fuel retailer in an area passes through increases in compliance costs by increasing gasoline prices, while another does not, the one with higher prices is at a significant competitive disadvantage.

- Retail motor fuel stations often have associated stores and/or services, such as car washes, repair operations, and convenience outlets, on which they can more successfully pass through increases in compliance costs.

When considered in the context of total fuel consumption in the United States, the proposed rule would represent only a very small fraction of motor fuel prices even if it was fully passed through to consumers. According to the Bureau of Transportation Statistics, the United States consumed 170,765,000,000 gallons of motor fuel (including gasoline and diesel) in 2008 at an average price of $3.27.[45] This implies that U.S. consumers spent $558 billion in 2008 on motor fuel. The overall cost of the proposed rule is roughly $210 million, less than one-tenth of one percent of the amount spent by end-users on motor fuel in 2008. In comparison, an increase of $0.01 in the average price of motor fuel in 2008 would have increased the total cost to consumers by approximately $1.7 billion. Given these circumstances, the proposed rule should not have a measurable impact on retail prices.

5.4 Regulatory Flexibility Analysis

The Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), 5 USC 601 et seq., generally requires EPA to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute. This analysis must be completed unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. If a regulation is found to have a significant impact on a

[45] The 2008 prices per gallon for all grades of retail motor gasoline and No. 2 diesel fuel (all concentrations of sulfur) were $3.32 and $3.15, respectively, as reported by the Bureau of Transportation Statistics in Table 3-8: Sales Price of Transportation Fuel to End-Users in National Transportation Statistics 2010 (at http://www.bts.gov/publications/national_transportation_statistics/pdf/entire.pdf). We weight these prices according to prime supplier sales volumes in 2009 published by the Energy Information Administration, which summed to 362,798.5 thousands of gallons per day for gasoline and 132,489.3 thousands of gallons per day for all grades of diesel fuel (at http://www.eia.gov/dnav/pet/pet_cons_prim_dcu_nus_a.htm).

substantial number of small entities, further analysis must be performed to determine what can be done to lessen the impact. Small entities include small businesses, small organizations, and small governmental jurisdictions. EPA developed a screening analysis and supplemental analysis consistent with the requirements under RFA; this section presents a summary of these findings, and Appendix L provides the detailed screening analysis.[46]

For purposes of assessing the impacts of this rule on small entities, a small entity is defined as: (1) a small business as defined by the Small Business Administration's (SBA) regulations at 13 CFR Part 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field. For the purposes of this analysis, EPA considered costs in excess of one percent and three percent of revenues as indications that the proposed rule may have a significant impact on a given small entity, and estimates of greater than 20 percent of total small firms or 1,000 total small firms affected as indications that a substantial number of small entities may be affected by the proposed rule.

5.4.1 Small Business Screening Analysis

We estimate that there are approximately 83,900 firms operating 162,000 facilities in the U.S. retail motor fuel sales sector.[47] This analysis assumes that all retail motor fuels firms operate underground storage tanks (UST systems) at all of their facilities. Based on the distribution of firms across revenue categories published by the 2002 Census, and SBA's revenue thresholds for NAICS 447110 and 447190, approximately 82,500 (98 percent) of these firms meet SBA's definition of a small entity.[48] Approximately 7,520 of these firms report revenues between $0 and $250,000 (the smallest revenue range published by the 2002 Census), with average sales of approximately $149,000.[49]

[46] This section focuses on the retail motor fuel sector. As discussed in Appendix L, EPA's screening assessment indicates that the proposed rule will not have a significant impact on a substantial number of small entities (SISNOSE) across all affected sectors. However, because 80 percent of all UST systems are in the retail motor fuel sector, we refined the screening assessment to further examine the potential impacts of the proposed rule on this sector.

[47] NAICS code 447 is comprised of 447110 (Gasoline stations with convenience stores) and 447190 (Other gasoline stations). To reconcile differing estimates of the number of retail fuel facilities (roughly 162,000 estimated by NPN, and 110,600 estimated by the Census), a 1.46 adjustment factor was applied to the Census data to inflate the number of retail motor fuel facilities to 162,000, distributed proportionately across revenue ranges. This approach preserves the distribution of firms by size according to Census data. As a result of this approach, we estimate that there are a total of approximately 83,900 firms and 481,000 tanks in the retail motor fuel sector.

[48] For 447110, the SBA revenue threshold is $27 million; for 447190, the SBA revenue threshold is $9 million. To ensure that we do not underestimate the number of small entities, we assume that all firms within a revenue bin that contains a specific SBA revenue threshold value are small. For example, if the SBA small business size threshold for a sector is $7 million, we assume that all firms in the revenue range of $5 to $10 million are small.

[49] Note that for simplicity we identify size categories in this document as described by the 2002 Census (e.g., revenues up to $250,000 in 2002 dollars), and identify compliance costs in 2008 dollars. However, in the actual screening analysis, compliance costs have been adjusted from 2008 dollars to 2002 dollars using the GDP implicit deflator. The estimated compliance cost is $300 per system in 2008 dollars, or $255 per tank in 2002

To determine whether firms reporting revenues within a given revenue range would incur costs exceeding one percent or three percent of total revenue, EPA compares the average total compliance cost per firm with the average revenue reported by firms in the revenue range. Based on a compliance cost per system of $300 (in 2008 dollars), and assuming that firms in the smallest revenue range own one facility with three UST systems, we estimate that the 7,520 small firms in the $0-$250,000 revenue range would face total compliance costs of $892 per firm (or $757 in 2002 dollars).[50] Any firm with annual revenues above approximately $75,700 (in 2002 dollars) (i.e., the revenue threshold at which compliance costs would exceed one percent of the firm's revenue) is not expected to experience a significant impact. The average revenue for the 7,520 firms in the $0-$250,000 revenue bin is $149,000, suggesting that on average, firms in this category will not experience significant impacts due to estimated compliance costs.

However, because the lowest range reported by the U.S. Census reflects a distribution of firms with revenues between $0 and $250,000, it is still possible that some of the 7,520 firms in this category may be significantly affected. As mentioned above, EPA also considered estimates of greater than 20 percent of total small firms or 1,000 total small firms affected as indications that a substantial number of small entities may be affected by the proposed rule. While the 7,520 small firms in the lowest revenue range represent only nine percent of all potentially affected small firms, EPA conducted a supplemental analysis that focuses on this group of small firms in an attempt to refine the estimated number of small firms potentially affected by the proposed rule.

5.4.2 Small Business Supplemental Analysis

The purpose of this supplemental analysis is to refine the results of the small business screening analysis. The Census Bureau provided additional data on firms in the lowest revenue bins for NAICS sectors 447110 (gasoline stations with convenience stores) and 447190 (other gasoline stations), identifying the percentage of firms with revenues in three ranges: (1) $0-$50,000; (2) $50,000-$150,000; and (3) $150,000-$250,000.[51] Based on this information, we estimate the number of firms in the retail motor fuel sales sector (i.e., NAICS 447) for these three

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dollars. These costs exclude compliance costs associated with the removal of deferrals for AHFDSs and UST systems with FCTs. AHFDS and FCT systems are primarily owned by the Department of Defense and not by any small entities.

[50] Census data on number of facilities per firm indicate that virtually all firms earning less than $250,000 per year in 2002 had only one facility. We therefore use "firm" and "facility" interchangeably in this context.

[51] The information provided by the U.S. Census Bureau is considered an "unpublished data request." As such, while the Census Bureau provided the data we requested, they also included a letter noting that "these are not 'official data' from the Census Bureau, since they do not meet the Census Bureau's quality standards. These data should be used with extreme caution, realizing the severe quality limitations that may exist." However, given that we do not have another source of information, we use this as the best data available.

revenue groups at approximately 550, 3,120, and 3,860, respectively and use these data to refine our estimate of the number of significantly affected facilities.[52]

Given compliance costs of $892 per firm ($757 in 2002 dollars), any firm making less than $75,700 and $30,000 would be considered significantly affected at the one percent and three percent revenue thresholds, respectively. EPA estimates that 1,348 firms are affected at the one percent threshold, and no firms are affected at the three percent threshold.

The number of firms that will be significantly affected at the one percent threshold exceeds the one thousand-firm substantial effect benchmark by 348 firms. However, it is likely that this proposed rule will have no SISNOSE for three reasons. First, 1,348 firms represent roughly one percent of potentially affected small firms, which is significantly lower than the 20 percent threshold (the other parameter considered in this analysis to determine a "substantial number").[53] Second, although the U.S. Census Bureau reports several hundred facilities with annual revenues less that $100,000, market economics suggest that it would be difficult for a firm that relies solely on gasoline sales to be viable if earning less than $100,000 in annual revenues, suggesting that some of these facilities may not be standalone entities.[54] Finally, at least some of the smallest facilities are likely to have fewer than the three tanks used as a basis for facility-level costs. EPA thus finds that the proposed rule does not appear likely to have a significant economic impact on a substantial number of small businesses.

5.4.3 Impacts to Small Governments

The *1992 Local Government Economic Impact Analysis* provides the best readily-available data on the number of governments owning UST systems, total UST systems owned by governments, average UST systems per government, and UST systems per owning government. The data include size and revenue for both general purpose (i.e., counties, municipalities, and townships) and special district governments (i.e., school districts and other special districts), dividing these governments into four size categories: very large, large, medium and small. The 1992 analysis defines a "very large" government as one that serves over 50,000 people;

[52] The analysis interpolates between the lower and upper bounds of each range and assumes a uniform distribution of facilities within each range. The lowest revenue interval is bounded at $35,750, which EPA obtains from estimating the linear trend between the zero and $250,000 in revenues. The implicit assumption is that no facilities earn less than that level of revenue

[53] EPA estimates a total of roughly 116,000 small firms with USTs across all affected sectors; 1,348 is roughly 1.2 percent of these. In NAICS 447, the 1,348 affected facilities represent 1.6 percent of facilities.

[54] Assuming $2 per gallon in sales, a facility earning $100,000 would sell less than 4,200 gallons of gasoline per month, compared with the monthly industry average throughput of approximately 130,000 gallons. Based on information from a mid-size retail fuel marketer, EPA believes that a facility requires a minimum throughput of approximately 30,000 gallons per month to remain economically viable. In addition, a facility would need $108,000 to generate enough gross profit to cover the direct cost of the wages of one full-time employee at minimum wage ($15,080 at $7.25 per hour and 2080 hours, before accounting for employment taxes). This does not consider other costs, such as electricity, property taxes, or franchise fees. As a result, while the supplemental analysis indicates that 1,348 firms will face costs that exceed the one percent revenue threshold, it is not clear whether all of these facilities represent average motor fuel retailers with full scale operations, three UST systems, and no other income.

therefore, all other entities are considered to be small governmental jurisdictions according to the RFA/SBREFA definition. Using the data from the 1992 analysis, we estimate the number of small governments that own UST systems based on the total universe of UST systems today. See Appendix L for additional detail.

EPA assumes that local governments collectively own four percent of active tanks. This equates to 24,458 tanks, based on the fiscal year 2009 universe of 611,449 tanks.[55] These 24,458 tanks are distributed among all local governments, based upon the percentage of tanks owned in 1992 by local governments in each size category (the average number of tanks owned by a government varies with the size of the government from one tank for small governments to 10 or more tanks for the largest governments).

EPA then calculates, using the 1992 data on government ownership of UST systems, the average compliance cost per government entity. This is done by multiplying the cost per tank by the number of UST systems per government by size category. The average annual revenue for each size of general purpose government is calculated using 2002 Census Data and weighted-average contributions that depend on type of entity (i.e., towns, municipalities, and counties). EPA extrapolates Census data on revenues for 4,128 townships to the 16,504 townships in the country. These weighted averages are combined to obtain annual revenues in 2002 dollars for general purpose governments, then inflated to 2008 dollars. Detailed information at the special district level is not available for later years, so budget expenditures from the 1992 analysis were inflated into 2008 dollars.[56]

To calculate how many small governments face significant compliance costs exceeding one or three percent of their revenues, we compared the average compliance cost per government with the average annual revenues to determine how many exceed either threshold. At a cost of $300 (2008 dollars) per UST system, no small governments are affected under either the one percent or three percent revenue threshold (see **Exhibit 5-3**). Correspondingly, EPA does not find that the proposed rule has any significant impact on a substantial number of small governments.

[55] Estimates of local government UST systems adjusted from 1992 ICF Analysis using The 1987 Census of Governments. See "Economic Impact Analysis of Additional Mechanisms for Local Government Entities to Demonstrate Financial Responsibility for Underground Storage Tanks," December 1992, Exhibit 3-1. Consistent with this analysis, the number of government UST systems is assumed to be one percent of all 2009 UST systems for state and federal governments and four percent of all 2009 UST systems for local governments.

[56] Typically, a RFA/SBREFA screening assessment uses revenues to assess economic impact measures for small governments. In the absence of detailed 2002 data, we use 1992 budget expenditures as a proxy for revenues.

Exhibit 5-3

Compliance Costs To Systems Owned By Governments

Type of Gov't	Size of Gov't[b]	UST Systems Per Owning Gov't[c]	Number of Gov'ts Owning Tanks[d]	2002 Est. Number of Gov'ts[e]	Average Annual Revenue ($2008)[f]	Average Cost Per Gov't ($)[g]	Gov'ts Exceeding 1% of Revenue	Gov'ts Exceeding 3% of Revenue
General Purpose[a]	Very Large	10.2	534	1,461	$316,129,836	$2,597	0	0
	Large	2.5	1,512	4,040	$35,687,794	$637	0	0
	Medium	1.4	1,444	7,822	$8,712,804	$356	0	0
	Small	1.1	1,048	25,644	$1,779,216	$280	0	0
	Subtotal	2.7	4,538	38,967				
Special Purpose	Very Large	3.7	336	934	$431,319,166	$942	0	0
	Large	3.6	1,902	5,340	$52,806,696	$917	0	0
	Medium	1.4	2,648	13,602	$2,533,231	$356	0	0
	Small	1.0	258	28,682	$128,013	$255	0	0
	Subtotal	2.4	5,144	48,558			0	0
Overall	Total	2.5	9,682	87,525			0	0

[a] General Purpose governments include counties, municipalities and townships. Special Purpose governments include public school systems and special districts.
[b] Very large governments are considered to serve more than 50,000 people. Large governments are considered to be those that serve between 10,000 and 50,000 people, medium governments as those that serve between 2,500 and 10,000 people, and small governments as those that serve 2,500 or fewer people. According to RFA/SBREFA, small governmental jurisdictions have populations under 50,000. Therefore, all sizes of governments except for "very large" are considered to be small.
[c] From 1992 *Local Government Impact Analysis* data.
[d] Calculated as number of tanks (adjusted 1992 distribution in each size category to reflect FY 2009 tank numbers) divided by UST systems per owning government (c).
[e] General purpose and Special Purpose total number of entities from 2002 Census of Governments, size distribution extrapolated from 1992 *Local Government Impact Analysis* data.
[f] General purpose estimates from 2002 Census of Governments; Special Purpose estimates inflated from 1992 *Local Government Impact Analysis* data.
[g] Calculated as number of systems per government (c) * estimated cost per tank ($255 in 2002$; $300 in 2008$).

5.5 Screening Analysis to Inform Impacts on Minority and Low-Income Populations

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) (59 FR 7629, Feb. 16, 1994) directs federal agencies, to the greatest extent practicable and permitted by law, to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

To inform us about the socioeconomic characteristics of communities potentially affected by the rule, EPA conducted a screening analysis to examine whether there is a statistically significant disparity between socioeconomic characteristics of populations located near UST facilities and those that are not.[57] The results indicate that minority and low-income populations

[57] Note that the affected populations identified in the screening analysis summarized here are simply defined by specific demographics surrounding UST locations. These affected populations are not necessarily equivalent to communities that others have specifically identified as "environmental justice communities."

are slightly more likely to be located near UST facilities. An environmental justice analysis would then require an assessment of whether there would be disproportionate and adverse impacts on these populations. However, because all regulatory options considered in this proposed rule would increase regulatory stringency and reduce the number and size of releases, EPA does not anticipate that the proposed rule will have any disproportionately high and adverse human health or environmental effects on these minority or low income communities, or on any community.

5.5.1 Risk Assessment Population Analysis

To characterize the extent of human health risk reductions anticipated under the proposed regulation, EPA conducted a screening-level analysis of the likely impact of the rule on benzene-related cancer incidence. This analysis used location data for nearly 60,000 U.S. gas stations with UST systems using an ESRI Business Analyst database, and examined populations within a buffer distance of 1,000 feet of facilities with UST systems. The ESRI gas station location data are supplemented with 1,600 UST systems in Indian country, based on location information compiled from EPA regional Indian country databases. After elimination of duplicates, the data set contains 59,945 UST facilities (including 727 in Indian country) (see **Exhibit 5-4**). The total data set represents over 25 percent of the roughly 220,000 active facilities with UST systems.[58]

To estimate populations near sample facilities, the analysis uses a "synthetic population" dataset developed by the Modeling of Infection Diseases Agents Study (MIDAS) to provide population estimates at a finer spatial resolution than Census blocks, while maintaining the accuracy of aggregate demographic data at the Census block group level. For more detail on this method, see Appendix M.

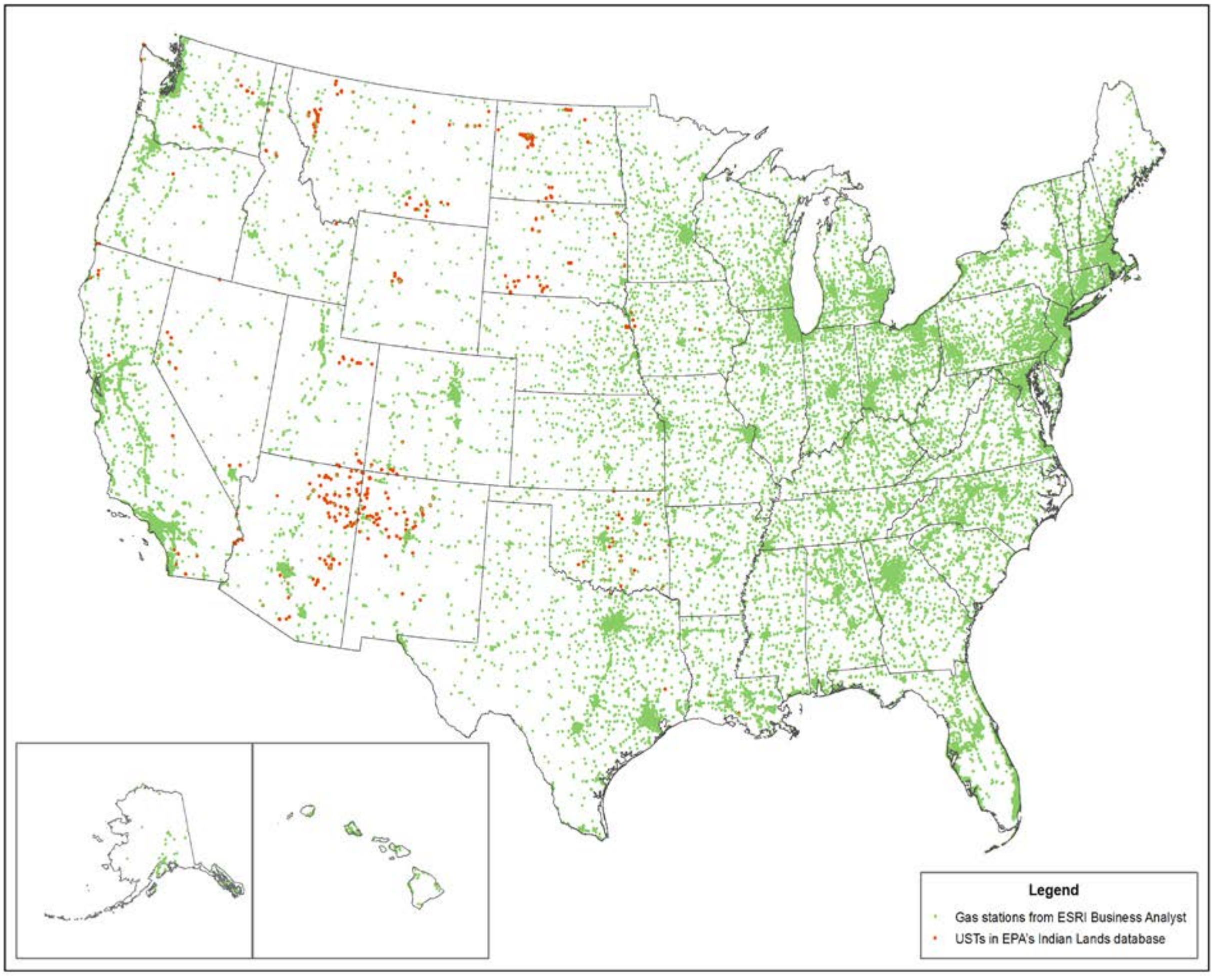
The modeled fate and transport of pollutants under a range of scenarios indicates that the contamination from UST releases do not typically exceed 1,000 feet.[59] The risk assessment considered population density within 1,000 feet of each UST, and incorporated estimates of the use of groundwater for drinking and bathing, along with typical exposure scenarios, to characterize the change in population risk likely to be associated with the reduction of 2,821 releases and groundwater incidents (i.e., the total estimated number of avoided releases and groundwater incidents resulting from the proposed regulations). The risk assessment concluded that the proposed regulations will result in a very small reduction in population risk related to cancer from benzene exposure, based on the estimated number and volume of avoided releases and groundwater incidents.

[58] 2009 Methodology Statement: ESRI Data—Business Locations and Business Summary. ESRI, Redlands, CA. available at http://www.esri.com/library/whitepapers/pdfs/infousa-business-database.pdf. ESRI data are derived from an infoUSA database. The approach for compiling business data for this database is documented on the infoUSA website (http://www.infousa.com), and includes systematic compilation of public record, phone books, business directories, and includes frequent review for new, updated, and relocated businesses. While this methodology does not capture all locations, it is not differentially focused on any specific region or information source, and therefore likely represents a reasonable spatial distribution of facilities.

[59] RTI International, "Risk Analysis to Support Revisions to Underground Storage Tank (UST) Regulations," December 22, 2010.

Exhibit 5-4

UST Location Data Used In Analysis. (See Appendix M for details on data sources.)



5.5.2 Demographic Analysis

The demographic analysis expands on the population data near the 59,945 gas stations in the risk assessment by characterizing demographic features of populations at each site and comparing these populations to larger (county-level) reference populations.[60] Specifically, the analysis examines the following demographic variables: percent in poverty, percent minority, and, as a verification step, percent white alone (the percentage of the population that specified their race as "white" and did not specify "Hispanic"). The analysis also identifies percent under five years old, percent under 18 years old to support the analysis required under Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (see section

[60] County-level statistics provide a useful comparative measure for the populations at the local facility level. Given that the area of interest is small (i.e., 1000 feet of a facility), the county-level provides an appropriate scale for comparison.

5.6 below). The analysis considers the significance of the "difference in means" and "difference in median" values for each census parameter and each community. That is, the analysis identifies the differences between mean and median concentrations of each demographic group for the affected and reference populations at each of the 59,945 sites, and examines whether the differences identified across all sites are statistically different from what would be expected in a random distribution.[61]

The analysis considers the differences in demographics in two ways: unweighted (each site is given equal weight) and population weighted (results are weighted by affected persons, giving sites with larger populations more weight). A statistically significant positive difference indicates a greater percentage of target demographic in the affected population than in the larger reference population. A statistically significant negative difference indicates a smaller percentage of the target demographic in the affected population. **Exhibit 5-5** provides the unweighted results of the analysis and generally finds that minority and low-income demographics constitute a slightly larger proportion of the population surrounding UST facilities. For example, poor populations account for 13.3 percent of the population near an UST, compared with 12.2 percent of the reference (county) population. As **Exhibit 5-6** shows, although the difference is small, it is also highly statistically significant (with a p-value below .001), which suggests that the difference between the values is not a random occurrence. **Exhibits 5-7 and 5-8** summarize the results of the population-weighted analysis, and generally find slightly larger (but still small) effects.

[61] See Appendix M for the complete demographic screening analysis.

Exhibit 5-5

Summary Results For Census Parameters – Unweighted

Census Parameter	1000 ft Buffer around Facility		County where Facility is Located		Difference			
							95% Confidence Interval of Mean Difference	
	Mean	Median	Mean	Median	Mean	Median	Lower Bound	Upper Bound
Percent White Alone	70.3	81.3	70.8	74.8	-0.44	1.29	-0.61	-0.27
Percent Under Age 5	6.7	6.5	6.7	6.7	-0.05	-0.12	-0.068	-0.032
Percent Under Age 18	24.7	24.9	25.6	25.5	-0.84	-0.54	-0.99	-0.68
Percent in Poverty	13.3	10.3	12.2	11.5	1.1	-0.64	0.99	1.13
Percent Minority	24.0	14.6	23.8	20.9	0.21	-1.48	0.06	0.36

Note: Difference summary statistics (mean and median) were calculated from the distribution of difference values (i.e., one result per facility, yielding a distribution of about 60,000 results). Mean values reflect the entire distribution, whereas the median values are based only on the 50^{th} percentile result. For this reason, the mean difference results could also be calculated simply by subtracting the reference community mean from the potentially affected community mean (e.g., for mean percent poverty 13.3 – 12.2 = 1.1). In contrast, the median difference values do not necessarily match values derived by subtracting the median values from the underlying distributions (e.g., for median percent poverty 10.3 – 11.5 ≠ -.64). Although the primary results of the analysis are based on mean values, median results are provided for completeness and as an alternative indicator of the distributions' central tendency.

Exhibit 5-6

Standard Error, T Test, And Risk Ratio Results – Unweighted

	1000 ft Buffer around Facility	County where Facility is Located	Difference				
	SE of Mean	SE of Mean	SE of Mean	T Statistic	p-value	Ratio	SE of Ratio
Percent White Alone	0.120	0.088	0.085	-5.23	<0.001	0.99	0.001
Percent Under Age 5	0.010	0.004	0.009	-5.18	<0.001	0.99	0.001
Percent Under Age 18	0.104	0.071	0.079	-10.59	<0.001	0.97	0.001
Percent in Poverty	0.045	0.023	0.038	27.66	<0.001	1.09	0.003
Percent Minority	0.104	0.071	0.079	2.71	0.0067	1.01	0.003

Note: There are >56,033 degrees of freedom for this test (i.e. number of facilities). Note that the total number of facilities in the dataset (59,945) differs from the degrees of freedom, because a fraction of facilities have no people living within the 1000 foot buffer.

Exhibit 5-7

Summary Results For Census Parameters – Weighted By Population

Census Parameter	1000 ft Buffer around Facility		County where Facility is Located		Difference			
							95% Confidence Interval of Mean Difference	
	Mean	Median	Mean	Median	Mean	Median	Lower Bound	Upper Bound
Percent White Alone	53.88	59.63	58.79	57.70	-4.61	-2.55	-5.0	-4.2
Percent Under Age 5	6.91	6.78	6.80	6.85	0.11	0.04	0.073	0.14
Percent Under Age 18	24.74	24.91	25.36	25.53	-0.62	-1.57	-0.73	-0.50
Percent in Poverty	16.22	13.34	13.33	12.83	2.89	0.96	2.7	3.1
Percent Minority	36.61	29.54	33.16	31.92	3.45	0.58	3.1	3.8

Note: Difference summary statistics (mean and median) were calculated from the distribution of difference values (i.e., one result per facility, yielding a distribution of about 60,000 results). Mean values reflect the entire distribution, whereas the median values are based only on the 50th percentile result. For this reason, the mean difference results could also be calculated simply by subtracting the reference community mean from the potentially affected community mean (e.g., for mean percent poverty 16.2 – 13.3 = 2.9). In contrast, the median difference values do not necessarily match values derived by subtracting the median values from the underlying distributions (e.g., for median percent poverty 13.3 – 12.8 ≠ -0.96). Although the primary results of the analysis are based on mean values, median results are provided for completeness and as an alternative indicator of the distributions' central tendency.

Exhibit 5-8

Standard Error, T Test, And Risk Ratio Results – Weighted By Population

	1000 ft Buffer around Facility	County where Facility is Located	Difference				
	SE of Mean	SE of Mean	SE of Mean	T Statistic	p-value	Ratio	SE of Ratio
Percent White Alone	0.288	0.193	0.205	-22.48	<0.001	0.92	0.0035
Percent Under Age 5	0.020	0.008	0.017	6.24	<0.001	1.02	0.0026
Percent Under Age 18	0.065	0.033	0.058	-10.62	<0.001	0.98	0.0023
Percent in Poverty	0.108	0.063	0.085	34.02	<0.001	1.22	0.0064
Percent Minority	0.255	0.165	0.191	18.05	<0.001	1.10	0.0058

Note: There are >56,033 degrees of freedom for this test (i.e. number of facilities). Note that the total number of facilities in the dataset (59,945) differs from the degrees of freedom, because a fraction of facilities have no people living within the 1000 foot buffer.

Overall, the demographic analysis identifies a small but statistically significant difference between minority and low-income populations near UST systems and in the reference communities. Minority and poverty-level demographics are present at greater percentages in the vicinity of UST facilities. In contrast, a small *negative* relationship suggests that "white alone" populations are less likely to be near UST systems, i.e., minority populations are marginally more likely to reside near UST facilities. Moreover, while the unweighted analysis does not find clear patterns related to children under 18 and children under five, the population-weighted analysis finds that the distribution of all target demographics around UST facilities reflects small but significant differences from county-level populations. The population-weighted results show greater differences, suggesting that facilities in higher population areas tend to have more pronounced disparities between local, potentially affected communities and reference (county-level) communities. These differences, while small, are statistically significant with p-values less than 0.01 in all cases. This result implies that any risk reductions associated with the proposed rule will occur in the context of a baseline condition in which minority and low-income populations are disproportionately located near USTs.

5.5.3 Summary and Limitations of the Analysis

This section summarizes a screening assessment and does not present a complete environmental justice analysis. The assessment is limited by the fact that demographic data from the U.S. Census are at the block group level, and are not as precise as the spatial distribution of population. As a result, if the demographic distribution of populations within block groups is uneven, the block group-level data may not accurately characterize populations living nearest to UST locations. The large sample of 59,945 sites, however, reduces the potential that this uncertainty could skew the results of the analysis.

Given the results of the screening analysis, because all regulatory options considered in this proposed rule would increase regulatory stringency and reduce the number and size of releases, EPA does not anticipate the proposed rule to have any disproportionately high and adverse human health or environmental effects on these minority or low income communities, or on any community. Since the proposed rule is not anticipated to create any new adverse human health or environmental impacts, EPA did not conduct a complete environmental justice analysis.

5.6 Children's Health Protection Analysis

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (62 FR 19885, April 23, 1997), applies to any rule that: (1) is determined to be "economically significant" as defined under E.O. 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

This action may be subject to Executive Order 13045 because it is economically significant as defined in Executive Order 12866. EPA's screening-level risk assessment examines potential impacts to groundwater and subsequent chemical transport, exposure and risk. While the risk assessment did not specifically measure exposure to children, the general exposure scenarios reflect four exposure pathways that have the most significant potential for human health impacts. These are:

- ingestion of chemicals in groundwater that have migrated from the source area to residential drinking water wells

- inhalation of volatile chemicals when showering with contaminated groundwater

- dermal contact with chemicals while bathing or showering with contaminated groundwater

- inhalation of vapors that may migrate upward from contaminated groundwater into overlying buildings

Adults and children can potentially be exposed through all four exposure pathways considered. For adults, inhalation of vapors while showering is the most significant adult exposure pathway; for children, ingestion is the most significant pathway, because children are assumed to take baths and are therefore not exposed via shower vapor inhalation. As a result of the longer exposure from showering, adults are the more sensitive receptor for cancer effects compared to children, particularly those under five who are assumed to take more baths and fewer showers.[62]

While the screening level risk assessment is limited in that it only examines benzene impacts, the proposed rule would likely reduce other contaminant exposures to children in a similar pattern, and would not create significant adverse impacts on children's health.

The screening-level demographic analysis described in section 5.5 finds a statistically significant result that children under the age of 18 and children under the age of five are slightly *less* likely to be found in the vicinity of UST facilities. This suggests that the impacts of the proposed rule will not have a disproportionate impact on children's health. Moreover, because all regulatory options proposed today would increase regulatory stringency and reduce the number and size of releases, EPA does not expect the proposed rule to have any disproportionate adverse impact on children.

[62] United States Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. "Toxicological Profile for Polycyclic Aromatic Hydrocarbons." August 1995.

Chapter 6. Other Statutory and Executive Order Analyses

As required by applicable statutes and executive orders, this chapter summarizes our analysis of equity considerations and other regulatory concerns associated with the proposed rule. This chapter assesses potential impacts, with respect to the following issues:

- **Regulatory planning and review**: requires examination and quantification of costs and benefits of regulating with and without the proposed rule.
- **Unfunded mandates:** examines the implications of the proposed rule with respect to unfunded mandates.
- **Federalism:** considers potential issues related to state sovereignty.
- **Tribal governments:** extends the discussion of federal unfunded mandates to include impacts on Native American tribal governments and their communities.
- **Joint impacts of rules:** discusses how other rules, together with the proposed rule, will likely affect the universe of facilities regulated by the proposed rule.

6.1 Regulatory Planning and Review

Under Executive Order 12866 [58 FR 51735 (October 4, 1993)], EPA, in conjunction with the Office of Management and Budget's (OMB's) Office of Information and Regulatory Affairs (OIRA), must determine whether a regulatory action is "significant" and therefore subject to OMB review and the full requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, the Agency has determined that this proposed rule is an economically significant regulatory action because it may have an annual effect on the economy of $100 million or more, as defined under part 3(f)(1) of the Order. Findings of the regulatory cost analysis (Chapter 3) indicate that the rule, as proposed, is projected to result in aggregate annual compliance costs of approximately $210 million under the Preferred Option, $520 million under Alternative 1, and $130 million under Alternative 2. Separately, this analysis concludes that the proposed rule is expected to have cost savings related to avoided costs of $300 million to $740 million under the Preferred Option, $310 million to $770 million under Alternative 1, and $110 million to $590 million under Alternative 2, but for the purposes of addressing Executive Order 12866, these cost savings are considered to be separate impacts rather than direct reductions in the total cost of the rule.

6.2 Unfunded Mandates Analysis

Signed into law on March 22, 1995, the Unfunded Mandates Reform Act (UMRA) calls on all federal agencies to provide a statement supporting the need to issue any regulation containing an unfunded federal mandate and describing prior consultation with representatives of affected state, local, and tribal governments.

The proposed rule is subject to the requirements of sections 202 and 205 of UMRA. In general, a rule is subject to the requirements of these sections if it contains "Federal mandates" that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more in any one year. The proposed rule results in approximately $180 million of costs to the private sector under the Preferred Option, $350 million under Alternative 1, and $120 million under Alternative 2 in expenditures for the private sector and is thus subject to the following requirements of these sections.[1]

- An identification of the provision of Federal law under which the proposed rule is being promulgated.

- A qualitative and quantitative assessment of the anticipated costs and benefits of the Federal mandate;

    - Costs and benefits to State, local, and tribal governments and the private sector
    - Effect on health, safety, and the natural environment
    - Analysis of extent to which such costs may be paid with Federal financial assistance (or otherwise paid for by the Federal government)
    - Analysis of the extent to which there are available Federal resources to carry out this mandate

- Estimates of future compliance costs with the mandate.

[1] Calculated as total compliance costs for conventional UST systems and EGTs (including costs to read regulations), documented in Exhibit 3-9, net of local and state government compliance costs identified in Exhibit 6-2 below.

- Estimates of disproportionate budgetary effects on any type of government or segment of the private sector.

- Estimates of the effect on the national economy (if relevant and possible).

Exhibit 6-1 provides references for the analyses that EPA has performed that respond to these requirements.

Exhibit 6-1

Location Of Analyses Responding To UMRA Requirements

Requirement	**Location**
Identification of provision of Federal law under which proposed rule is being promulgated	Chapter 1 of this document
Assessment of costs and benefits to State, local, and tribal governments and the private sector	Chapters 3 and 4 of this document
Assessment of the effect on health, safety, and the natural environment	Chapter 4 of this document
Assessment of the extent to which such costs may be paid with Federal financial assistance	Chapter 3 of this document; no Federal assistance is anticipated
Assessment of the extent to which there are available Federal resources to carry out this mandate	Chapter 3 of this document; no Federal resources are anticipated
Estimates of future compliance costs	Chapter 3 of this document
Estimates of disproportionate budgetary effects on any type of government or private sector segment	Chapter 5 of this document
Estimates of the effect on the national economy	Chapters 3 and 5 of this document

6.3 Federalism Analysis

Executive Order 13132, entitled “Federalism” (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure “meaningful and timely input by state and local officials in the development of regulatory policies that have federalism implications.” “Policies that have federalism implications” is defined in the Executive Order to include regulations that have “substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.” EPA typically considers a policy to have federalism implications if it results in the expenditure by State and/or local governments in the aggregate of $25 million or more in any one year.

Under Executive Order 13132, EPA may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the regulation.

Exhibit 6-2 summarizes annual government costs. Direct compliance costs for local and State governments reflect average costs per UST system; the analysis assumes that states collectively own one percent of total UST systems (6,114), and local governments own 24,458 UST systems (four percent).

In addition, under the proposed rule, each state will incur labor costs for reading the new regulations, applying for State Program Approval (SPA), and processing one-time notification of existence for EGTs, AHFDSs, and FCTs. States that do not already require notification of UST ownership change will also incur costs to process and review all ownership change notifications of UST system ownership change.

In this scenario, total costs to all affected state and local governments (including direct compliance costs, notification costs, and state program costs) are approximately $9.3 million under the Preferred Option, $19 million under Alternative 1, and $6.5 million under Alternative 2 in 2008 dollars; this is not considered to be a substantial compliance cost under federalism requirements.

Exhibit 6-2

Summary Of Annual State And Local Government Costs[b]

Element	**Preferred Option ($ millions)**	**Alternative 1 ($ millions)**	**Alternative 2 ($ millions)**
Local Compliance Costs[a]	$7.3	$15.0	$5.0
State Compliance Costs[a]	$1.8	$3.7	$1.3
State Government Administrative Costs	$0.2	$0.2	$0.2
Total State and Local Governments Costs	**$9.3**	**$19.0**	**$6.5**

[a] State and local government compliance costs are included in the total compliance costs presented in Exhibit 3-9.
[b] Cost estimates were derived using a seven percent discount rate.

6.4 Tribal Governments Analysis

Executive Order 13175, entitled "Consultation and Coordination with Indian Tribal Governments" (65 FR 67249, November 9, 2000), requires EPA to develop an accountable process to ensure "meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications." EPA has concluded that this action will have tribal implications to the extent that tribally-owned entities with UST systems on Indian country would be affected. However, it will neither impose substantial direct compliance costs on tribal governments, nor preempt Tribal law.

The data sources for the Indian country analysis are the same as those used in the small business analysis. Based on a review of information available about the types of business entities in Indian country, it is assumed that UST systems in Indian country represent a subset of the rest of the universe and are distributed similarly across the same sectors.[2] The total number of UST systems in Indian country is distributed proportionally among the NAICS sectors.

The cost per UST system is higher in Indian country, as the universe is smaller, and all UST systems are assumed to incur costs associated with all the requirements of the proposed rule. At a 2008 cost of $795 per UST system, the total cost for UST systems in Indian country is

[2] For more detail, see Industrial Economics, Inc., "Detailed Assessment of UST Universe by Tank Purpose and Design," WA 1-25, Task 6, March 24, 2009. Note that because tribal ownership and operation is defined differently than other types of government ownership, no attempts are made to isolate or identify "government" UST systems in Indian country.

approximately $2.1 million. EPA data indicates that 35 percent of all UST systems in Indian country are tribally-owned; correspondingly, the total cost to owners and operators of tribally-owned UST systems is $0.7 million.

EPA consulted with tribal officials early in the process of developing this regulation to permit them to have meaningful and timely input into its development. EPA began its consultation with tribes on possible changes to the UST regulations shortly after the passage of the Energy Policy Act of 2005 (EPAct). EPAct directed EPA to coordinate with tribes to develop and implement an UST program strategy in Indian country to supplement the program's existing approach. EPA and the tribes worked collaboratively to develop this tribal strategy.

EPAct also included key provisions that apply to states receiving federal funding but the Act did not specify Indian country. Nonetheless, EPA's goal is to implement the objectives of these provisions in Indian country as an important step in achieving more consistent program results in release prevention. Both EPA and tribes recognize the importance of having policies that can help to ensure parity in program implementation between states and in Indian country. EPA committed to the tribes that we would fully implement the new provisions of the EPAct, and the proposed regulations will realize that commitment.

In addition to our early consultation with the tribes, EPA also reached out again to the tribes as we started the official regulatory process and throughout the development of these proposed regulations. EPA sent letters to leaders of over 500 tribes as well as to tribal regulatory staff to invite their participation in the development of the regulations. EPA heard from both tribal officials who work as regulators as well as representatives of owners and operators of UST systems in Indian country. The tribal regulators raised concerns about ensuring parity of environmental protection between states and Indian country.

The proposed changes to the UST regulations are needed to ensure parity between sites in states and in Indian country. These regulations are also needed to ensure equipment is not just installed but is working properly to protect the environment from potential releases.

6.5 Joint Impacts of Rules

Executive Order 12866 requires that the Agency review whether the proposed rule creates "a serious inconsistency" or otherwise interferes "with an action taken or planned by another agency." We do not believe that the proposed rule creates a serious inconsistency or interferes with any other actions planned or undertaken by other agencies. The following are the existing regulations that currently affect UST systems:

- **State UST Regulations:** A number of states have existing UST regulations that are more demanding than existing regulations under 40 CFR Part 280. To the extent that these policies are at least as demanding as the regulations under consideration, the systems in these states may already be in partial or full compliance with portions of the proposed rule. Chapter 2 identifies the number of UST systems in states with existing (baseline) regulations; cost estimates in Chapter 3 reflect the state regulatory programs that exist in the baseline.

- **SPCC Regulations:** Currently, a subset of UST systems in the universe is regulated by Spill Prevention, Control, and Countermeasure rules (SPCC); these include emergency generator tanks, airport hydrant fuel distribution systems and UST systems with field-constructed tanks. Specifically, SPCC rules in 40 CFR Part 112 apply to above-ground containers and completely buried tanks that are not otherwise covered by the regulations of 40 CFR Part 280. SPCC rules do not specify particular leak detection protocols, but require that plans conform to industry standards, which can often be consistent with the requirements of the proposed rule. To the extent that the requirements imposed on these UST systems via the proposed rule are more or less stringent than the SPCC rules currently governing them, the proposed rule may cause an increase or a reduction in overall inspection and monitoring requirements (and costs) for these UST systems. To account for this, EPA has generated baseline assumptions for these systems using information from the Department of Defense (the owner of the majority of all FCTs and AHFDSs). EGTs are assumed to incur all incremental costs beyond state regulatory baseline costs; to the extent that these systems are regulated under SPCC, this may overstate costs.

Chapter 7. Comparison of Costs, Benefits, and Other Impacts

This chapter provides several analyses that compare the costs and beneficial impacts of the proposed rule. Cost-benefit analysis is a central feature of virtually all economic assessments and evaluates the economic efficiency of environmental policies by measuring their costs and benefits, and hence their net impacts on society. From an economic viewpoint, the proposed rule would enhance economic efficiency if beneficial impacts exceed costs.

A traditional cost-benefit comparison weighs society's willingness to pay for the benefits of a regulation against the opportunity costs of the rule. Analyses of this type typically do not consider distributional issues, although they can be adapted to do so. Adherence to a strict benefit-cost approach provides an incomplete assessment of the effects of this proposed rule for two reasons:

- The majority of positive effects from new requirements occur as avoided remediation costs, not social benefits such as improved water quality. Monetizable social benefits occur only in the form of avoided cancer cases and constitute only a very small part of overall effects. Nevertheless, as discussed in Chapter 4, avoided costs provide a reasonable measure of the positive effects of the proposed rule.

- A key effect of the proposed rule is to reallocate costs from the public to responsible parties. This is likely to improve behavioral incentives, as the parties most likely to cause releases will also be responsible for preventing them. As we discussed in Chapter 5, savings to state financial assurance funds could exceed $150 million per year.

While this chapter presents a comparison of costs and benefits, the principal comparison is between avoided remediation costs and the cost of the proposed rule. This chapter uses two approaches to assess the effectiveness of the proposed requirements. First, we compare the compliance costs of the proposed rule with its total monetized avoided costs and benefits. We then consider cost-effectiveness measures which provide estimates of expenditures per unit reduction of releases and estimates of the cost per unit of benefit achieved by the proposed rule.

Cost-benefit and cost-effectiveness analyses, however, should not be the only tools used in the establishment of any final regulatory action. The proposed rule is expected to provide other benefits that are not expressed in monetary terms. When these benefits are taken into account, along with equity-enhancing effects such as reduction in demand for publicly-funded remediation, the benefit-cost comparison becomes more complex. Consequently, the final regulatory decision becomes a policy judgment that takes into account efficiency as well as equity concerns.

In addition, the selection of a discount rate for estimating the present value of future costs and benefits is a complex issue. To reflect a range of possible future costs and benefits, we present two estimates of discounted costs and benefits; one based on a seven percent discount rate, and one based on a three percent discount rate.

7.1 Cost Benefit Comparison

In this section, we compare the total costs of the rule with its total monetized and non-monetized benefits and avoided costs. The total costs and monetized avoided costs of the proposed rule are summarized in **Exhibit 7-1**. The costs in the exhibit represent the compliance costs of the proposed rule, including state government administrative costs.

The exhibit also shows the social benefits of the proposed requirements that are not captured in avoided costs. Monetized social benefits are calculated only for avoided cancer risks related to benzene due to the difficulty in measuring other types of benefits. Avoided cancer risks are estimated to be minimal, as they address only the uncontrolled human health risks that occur before discovery and remediation of a release under existing programs. EPA estimates less than $5,000 in measurable, monetized social benefits per year, regardless of the option. However, as **Exhibit 7-1** notes and discussed in Chapter 4, a number of benefits could not be monetized, including groundwater protection, mitigation and avoidance of acute events, ecological benefits, and non-benzene human health risks.

Exhibit 7-1 demonstrates that the proposed rule may avoid more costs than it creates, potentially generating cost savings to society. EPA estimates that the Preferred Option could generate $90 million to $530 million per year in savings to society. Alternative 1 could have a net benefit of $250 million to a net cost of $210 million, while Alternative 2 could generate savings of $460 million to costs of $20 million.

Exhibit 7-1

Comparison Of Annual Compliance Costs, Cost Savings And Monetized Benefits[f,g]

	Preferred Option (2008$ millions)	Alternative 1 (2008$ millions)	Alternative 2 (2008$ millions)
Annual Monetized Benefits			
Avoided cancer risks[a,d]	$0.001 - $0.005	$0.002 - $0.005	$0.001 - $0.003
Annual Avoided Costs[d]			
Releases and groundwater incidents	$300 - $700	$300 - $740	$110 - $570
Vapor intrusion	$0.4 - $26	$0.5 - $28	$0.2 - $19
Product loss	$2.0 - $7.2	$2.6 - $7.6	$0.4 - $5.3
Annual Compliance Costs			
Conventional UST systems[b]	$180	$360	$120
Emergency generator tanks (EGTs)	$2	$2	$2
Airport hydrant fuels distribution systems (AHFDSs)	$18	$120	N/A
UST systems with field-constructed tanks (FCTs)	$5	$33	N/A
Cost to owners/operators to read regulations	$5	$5	$5
State government administrative costs[c]	$0.2	$0.2	$0.2
Total Annual Benefits and Avoided Costs	**$300 - $740**	**$310 - $770**	**$110 - $590**
Total Annual Compliance Costs[g]	**$210**	**$520**	**$130**
Net Cost (Savings) to Society[g] **[Total Compliance Costs *less* Total Benefits and Avoided Costs]**	**($530) - ($90)**	**($250) - $210**	**($460) - $20**
Nonmonetized Benefits[e]			
Groundwater protected (billion gallons)	110 - 350	120 - 370	41 - 250
Acute events and large-scale releases (e.g., releases from AHFDSs and FCTs)	Not estimated	Not estimated	Not estimated
Ecological benefits	Not estimated	Not estimated	Not estimated
Non-benzene human health risks	Not estimated	Not estimated	Not estimated

[a] The pathway assessed to evaluate avoided cancer risk is benzene exposure through contaminated groundwater.

[b] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.

[c] The costs for UST systems directly owned or operated by local, state, and federal government entities are included in the estimates of compliance costs within the other categories. Costs shown here reflect the administrative costs for state governments to read the regulation, apply for state program approval, process notifications of ownership changes, and process one-time notifications of EGT, AHFDS, and FCT existence.

[d] Avoided cancer risks and avoided costs are separate and additive (i.e., these estimates do not overlap). Avoided cancer risks are the benefits associated with reducing cancer cases prior to discovery of the release. Avoided remediation costs from releases and groundwater incidents are the costs related to site remediation. Avoided vapor intrusion costs include additional avoided costs associated with the remediation of vapor intrusion cases; the RIA does not address human health risk associated with vapor intrusion. Avoided product loss costs are also separate and additive.

[e] Due to data and resource constraints, EPA is unable to monetize some of the positive impacts of the proposed rule. Chapter 4 of this document provides a qualitative discussion of these benefits.

[f] Totals may not add up due to rounding. Cost estimates were derived using a seven percent discount rate.

[g] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

7.1.1 Cost-Benefit Comparison under the Alternative Baseline Scenario

Exhibit 7-2 depicts the comparison of costs and benefits of the proposed rule in the alternative baseline scenario, where the universes of releases and UST systems decline over time in accordance with historical trends. In this alternative baseline, the universe of releases is smaller relative to the original baseline than the universe of UST systems; however, **Exhibit 7-2** demonstrates that even in this case, the proposed rule may avoid more costs than it creates, potentially generating cost savings to society. EPA estimates that the Preferred Option in the alternative baseline could generate between $240 million per year in savings to $20 million per year in costs to society. Alternative 1 could have a net cost of $50 million to $330 million, while Alternative 2 could generate savings of $240 million to costs of $56 million.

Exhibit 7-2

Comparison Of Annual Compliance Costs, Cost Savings And Monetized Benefits Using an Alternative Baseline[f,g]

	Preferred Option (2008$ millions)	**Alternative 1 (2008$ millions)**	**Alternative 2 (2008$ millions)**
Annual Monetized Benefits			
Avoided cancer risks[a,d]	$0.001 - $0.003	$0.001 - $0.003	$0.0003 - $0.002
Annual Avoided Costs[d]			
Releases and groundwater incidents	$180 - $420	$180 - $440	$64 - $340
Vapor intrusion	$0.3 - $16	$0.3 - $17	$0.1 - $11
Product loss	$1.2 - $4.3	$1.6 - $4.6	$0.2 - $3.2
Annual Compliance Costs			
Conventional UST systems[b]	$170	$350	$110
Emergency generator tanks (EGT)	$2.2	$2.2	$2.1
Airport hydrant fuels distribution systems (AHFDSs)	$18	$120	N/A
UST systems with field-constructed tanks (FCTs)	$4.6	$33	N/A
Cost to owners/operators to read regulations	$5.1	$5.1	$5.1
State government administrative costs[c]	$0.2	$0.2	$0.2
Total Annual Benefits and Avoided Costs	**$180 - $440**	**$180 - $460**	**$64 - $360**
Total Annual Compliance Costs[g]	**$200**	**$510**	**$120**
Net Cost (Savings) to Society[g] **[Total Compliance Costs *less* Total Benefits and Avoided Costs]**	**($240) - $20**	**$50 - $330**	**($240) - $56**
Nonmonetized Benefits[e]			
Groundwater protected (billion gallons)	65 - 210	71 - 220	25 - 150
Acute events and large-scale releases (e.g., releases from AHFDSs and FCTs)	Not estimated	Not estimated	Not estimated
Ecological benefits	Not estimated	Not estimated	Not estimated
Non-benzene human health risks	Not estimated	Not estimated	Not estimated

[a] The pathway assessed to evaluate avoided cancer risk is benzene exposure through contaminated groundwater.
[b] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[c] The costs for UST systems directly owned or operated by local, state, and federal government entities are included in the estimates of compliance costs within the other categories. Costs shown here reflect the administrative costs for state governments to read the regulation, apply for state program approval, process notifications of ownership changes, and process one-time notifications of EGT, AHFDS, and FCT existence.
[d] Avoided cancer risks and avoided costs are separate and additive (i.e., these estimates do not overlap). Avoided cancer risks are the benefits associated with reducing cancer cases prior to discovery of the release. Avoided remediation costs from releases and groundwater

incidents are the costs related to site remediation. Avoided vapor intrusion costs include additional avoided costs associated with the remediation of vapor intrusion cases; the RIA does not address human health risk associated with vapor intrusion. Avoided product loss costs are also separate and additive.
[e] Due to data and resource constraints, EPA is unable to monetize some of the positive impacts of the proposed rule. Chapter 4 of this document provides a qualitative discussion of these benefits.
[f] Totals may not add up due to rounding. Cost estimates were derived using a seven percent discount rate.
[g] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

7.2 Cost-Effectiveness Analysis

We measure cost-effectiveness by considering the expected cost per release avoided. This cost-effectiveness measure is useful for comparing the resources required to eliminate a single release under each alternative. For the purpose of this analysis, we consider avoided releases to be both releases altogether avoided and groundwater incidents averted due to the proposed rule. As presented in **Exhibit 7-3**, we find that the cost per release avoided is approximately $38,000 to $120,000 under the Preferred Option, compared with $90,000 to $290,000 under Alternative 1 and $33,000 to $200,000 under Alternative 2. This compares favorably with average release remediation costs presented in **Exhibit 4-2** in Chapter 4, which range between $92,000 and $194,000. This regulatory impact analysis suggests that, in addition to improving the alignment of incentives, release prevention is likely to be less costly than release remediation under the Preferred Option and Alternative 2 and in some instances under Alternative 1.

Exhibit 7-3

Cost-Effectiveness: Number Of Avoided Releases And Groundwater Incidents[a]

	Preferred Option	Alternative 1	Alternative 2
Avoided releases and groundwater incidents	1,680 - 5,370	1,820 - 5,780	630 - 3,860
Compliance cost[b] ($ million)	$210	$520	$130
Cost per release avoided ($ million)	**$0.038 - $0.12**	**$0.09 - $0.29**	**$0.033 - $0.20**

[a] Cost estimates were derived using a seven percent discount rate.
[b] Compliance cost includes direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

7.3 Costs and Beneficial Effects Under Alternative Discount Rates

The selection of the rate at which to discount future costs and benefits is complex. To assess the sensitivity of our results to our choice of discount rate, **Exhibit 7-4** presents a summary of total compliance costs and avoided remediation costs considering alternate discount rates of three percent and zero percent (i.e., no discounting). Costs change little because a reduction in interest rates both reduces time value of money (TVM) costs and increases costs that have a delay before implementation.[1,2] The net result of a change from a discount rate of seven

[1] When amortizing a value over time, if all other factors are held constant, a reduction in the rate of interest decreases the annual payment.

[2] The rate of discount enters into our calculation of time value of money costs. Higher discount rates increase these costs, while lower discount rates cause them to decrease. See Appendix D for details.

percent to a discount rate of zero percent is an overall increase in the cost of the rule of less than $10 million per year, indicating that TVM and delayed-implementation cost effects essentially offset each other.

Discount rates are also involved in our estimate of annual avoided costs. In particular, we use them only to obtain constant annual avoided costs for those requirements in which the affected universe grows over time and calculate the delay until positive impacts accrue.[3] Here, the effect of lowering interest rate is more significant, as all requirements are discounted by at least one period. As **Exhibit 7-4** shows, a change in the rate of discount from seven percent to zero percent increases avoided costs from a range of $300 million - $740 million to $340 million - $810 million. This increase is largely due to the fact that we discount all avoided costs by at least one year, as outlined in **Exhibit 1-2**.

We conclude that, while a reduction in the discount rate leaves annual compliance costs essentially unchanged at $210 million, avoided costs increase from by $40 million to $70 million per year. As such, annual savings to society would increase from a range of $90 million - $530 million to $130 million - $600 million if EPA relies on a zero rate of discount.

Exhibit 7-4

Compliance Costs And Beneficial Impacts Under Alternative Discount Rates[d,e]

Avoided Cost	**Preferred Option 7 percent discount rate ($ millions)**	**Preferred Option 3 percent discount rate ($ millions)**	**Preferred Option Undiscounted ($ millions)**
Annual Monetized Benefits			
Avoided cancer risks[a]	$0.001 - $0.005	$0.001 - $0.005	$0.002 - $0.005
Annual Positive Impacts (Avoided Costs)			
Releases and groundwater incidents	$300 - $700	$320 - $740	$340 - $770
Vapor intrusion	$0.4 - $26	$0.4 - $27	$0.5 - $28
Product loss	$2.0 - $7.2	$2.0 - $7.4	$2.1 - $7.7
Annual Compliance Costs			
Conventional UST systems[b]	$180	$180	$180
Emergency generator tanks (EGT)	$2.2	$2.2	$2.2
Airport hydrant fuels distribution systems (AHFDSs)	$18	$21	$22
UST systems with field-constructed tanks (FCTs)	$4.6	$5.2	$5.6
Cost to owners/operators to read regulations	$5.1	$3.7	$2.7
State government administrative costs[c]	$0.2	$0.2	$0.2
Total Annual Avoided Costs	**$300 - $740**	**$330 - $770**	**$340 - $810**
Total Annual Compliance Costs[e]	**$210**	**$210**	**$210**
Net Cost (Savings) to Society[e] [Total Compliance Costs *less* Total Avoided Costs]	**($530) - ($90)**	**($560) - ($120)**	**($130) - ($600)**

[a] The pathway assessed to evaluate avoided cancer risk is benzene exposure through contaminated groundwater.
[b] Conventional UST systems include all systems that are not AHFDSs, FCTs, or EGTs.
[c] The costs for UST systems directly owned or operated by local, state, and federal government entities are included in the estimates of compliance costs within the other categories. Costs shown here reflect the administrative costs for state governments to read the regulation,

[3] These requirements are the elimination of flow restrictors as overfill prevention for new tanks and when overfill devices are replaced, closure of lined tanks which cannot be repaired, and all Energy Policy Act requirements in Indian country, with the exception of operator training.

apply for state program approval, process notifications of ownership changes, and process one-time notifications of EGT, AHFDS, and FCT existence.

[d] Totals may not add up due to rounding.

[e] Compliance costs include direct compliance costs and state oversight costs. For this regulatory impact analysis, direct compliance costs and state oversight costs provide a reasonable proxy to assess the proposed rule's social costs. See Chapter 3.1 for further discussion.

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