Reassessing Exposure Threats from Petroleum Underground Storage Tank Releases

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Introduction

Collectively, underground storage tank program implementing agencies[1] have resolved over half a million UST release cases since the inception of the program nearly four decades ago. However, approximately 55,000 petroleum UST release cases remain open, many of which are in the investigation or cleanup phase, with a significant number not progressing toward closure.

This policy statement encourages implementing agencies to use exposure threat assessments as part of their petroleum UST release corrective action[2] programs. It provides broad guidelines that implementing agencies can tailor to their UST programs to focus attention on higher threat releases and increase the number of UST releases progressing toward closure. While implementing agencies may integrate exposure threat assessments into their programs in different ways, the objective should always be the same -- to ensure protection of human health and the environment.

Exposure threat assessment (hereinafter referred to as "threat assessment") in the context of this policy statement means the evaluation of the potential for a release from a petroleum UST to reach a human or ecological receptor. A threat assessment identifies current and reasonably anticipated future exposures to human and ecological receptors by examining the:

- Stability of the contamination remaining in the subsurface.
- Pathways to receptors.
- Potential of the contamination to reach receptors.

Threat assessments typically are based on data already collected in prior site investigation and monitoring activities, and do not necessitate additional field work.

A threat assessment at an individual UST release site helps to determine if the threat is:

- High and the site needs further corrective action.
- Undetermined and the site needs further investigation.
- Low and the site does not need of further corrective action.

Release sites that pose a low threat may not need additional cleanup work and can be moved to regulatory closure, allowing UST implementing agencies to focus their resources on high-threat release sites. For example, a release that is stable (i.e., no longer migrating) and is not expected to reach human or ecological receptors could be considered a low-threat release.

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[1] For this policy statement, implementing agencies include states and territories that regulate corrective actions for UST releases and Tribal and local governments who may also address UST releases.

[2] This document uses the terms *cleanup* and *corrective action* interchangeably to refer to all activities related to the investigation, characterization, cleanup, remediation, monitoring, and closure of an UST release.

Advances in scientific understanding of petroleum release behavior, as well as decades of experience cleaning up sites have improved our ability to assess current threats from UST petroleum releases. Today, UST release corrective action programs can:

- Establish cleanup goals based on screening distances and plume stability rather than on worst-case fate and transport assumptions.
- Have confidence in natural attenuation processes, which have been demonstrated to play a central role at petroleum release sites.

ASTM recently issued the *E3488 Standard Guide for Moving Sites to Closure (MStC) for Petroleum Underground Storage Tank (UST) Releases*. ASTM's MStC standard provides a framework based on the latest science and best practices for conducting threat assessments and moving UST release sites to closure. The MStC standard represents one possible approach for incorporating threat assessments into corrective action programs.

Purpose

Through this policy statement EPA encourages UST implementing agencies to use threat assessments to better inform investigation and cleanup activities and to move UST releases toward closure. This can be accomplished by:

- Re-evaluating and assessing threats from open UST releases.
- Incorporating current best practices, tools, and scientific understanding of petroleum releases into their threat assessment – tools and science that might not have been available when the threats from the release sites were first evaluated and the original cleanup goals established.
- Making the threat assessment process open and transparent so owners and other stakeholders can be better informed about the threats posed by releases and collaborate with regulators on a course of action going forward.

This policy statement is consistent with Subtitle I of the Solid Waste Disposal Act, as amended, Underground Storage Tank Regulations, and Leaking Underground Storage Tank Trust Fund Corrective Action Cooperative Agreement Guidelines, and is not intended to change their meaning or interpretation. Further analysis of the law and regulations is included in Appendix A.

Risk-Based Decision-Making and Threat Assessment

Most UST implementing agencies have well-established systems for assessing risk and establishing cleanup priorities to ensure timely action for petroleum UST releases. For several decades, EPA has advocated for and supported the use of risk-based decision-making in UST corrective action programs. Risk-based decision-making is a process that uses risk and exposure

assessment methodologies. Risk-based decision-making helps UST implementing agencies make determinations about the extent and urgency of corrective action and about the scope and intensity of their oversight of corrective action by UST owners and operators.[3] Considering risk and exposure from UST releases is foundational to the UST release site cleanup laws and regulations.

This policy statement encourages implementing agencies to take a fresh look at current exposure threats at UST release sites using the latest scientific understanding and current best practices. Assessing threats posed by UST releases can be valuable regardless of how implementing agencies set initial cleanup goals.

Some UST implementing agencies have already taken steps to re-evaluate current threats within their case load, focus action on high-threat release sites, and implement measures to resolve lower threat releases. Threat assessment policies that have been implemented are helping to move corrective actions toward closure, reduce the number of open releases, and ensure that cases with unresolved threats are addressed.

Threat assessments do not replace risk-based decision-making and risk-based decision-making is not required for a program to benefit from threat assessments. Appendix B discusses the relationship between this policy statement and related ASTM standards and existing EPA Directives. Appendix C describes and clarifies common misconceptions about threat assessments.

Threat Assessment in the UST Release Corrective Action Process

Threat assessments can help UST implementing agencies and owners identify necessary and appropriate action throughout the corrective action process. When a threat assessment indicates potential exposures to human or ecological receptors, appropriate action may include:

- Additional site investigation if threat assessment is inconclusive.
- Active or passive remediation.
- Containment.
- Engineering controls.
- Institutional controls.

Threat assessments can be performed at any time—from when a release is discovered to before a site is closed. While threat assessments can be useful at any release, they may be most useful for UST release sites where the corrective action has been open for a long period of time

[3] *Use of Risk-Based Decision-Making in UST Corrective Action Programs* (EPA, 1995).

or where the corrective action has stopped making progress. At such UST release sites, threat assessment can provide an up-to-date perspective on the current site conditions and provide an opportunity to focus assessment and remedial efforts on specific exposures or pathways. Threat assessments can also be useful when there is a need to communicate the current conditions and future plans to owners and stakeholders.

Threat assessments can be made regardless of how close the corrective action is to meeting the initial cleanup goals. For example, the initial cleanup goal for a release might include removal of all measurable light non-aqueous phase liquid. If that goal has not been met after a certain amount of time, threat assessment might be used to determine if the remaining LNAPL is migrating, contributing to an expanding groundwater plume, or contaminating indoor air. If not, the implementing agency might conclude that, even though the initial LNAPL removal cleanup goal was not met, the UST release site could be moved to regulatory closure because exposure threat to receptors is low.

Threat assessments can consider a variety of data and criteria. For example, there are at least five scientifically defensible ways to determine if LNAPL is stable and not migrating. Also, a variety of criteria are available for assessing groundwater, soil, and vapor intrusion exposures. Allowing alternative criteria will increase the likelihood that the threat assessments can be conducted using existing site data, reducing the cost and time needed to complete a threat assessment. In some cases, the threat assessment may indicate specific supplemental site data that needs to be collected to assess the threat.

Benefits of Threat Assessment at UST Release Sites

Threat assessments can help UST implementing agencies and UST owners and operators improve their management of petroleum UST cleanups by:

- Identifying previously unrecognized threats that may require mitigation or corrective action.
- Identifying data gaps that require additional site investigation.
- Taking timely action at numerous UST release sites.
- Ensuring that site investigations and cleanups are targeted at reducing threats.
- Communicating the current conditions and future objectives to stakeholders.
- Controlling corrective action costs and making them more predictable.

In addition, threat assessments can help facilitate site reuse. By closing low-threat UST release sites, implementing agencies can reduce the uncertainty associated with corrective action, making the sites more attractive investments for economic redevelopment. Additional information on financing and reuse of release sites can be found at:

- epa.gov/brownfields.
- epa.gov/ust/petroleum-brownfields.

EPA Assistance to UST Implementing Agencies

EPA's Office of Underground Storage Tanks and regional offices will promote development and implementation of threat assessment processes through information sharing and technical assistance. EPA expects to offer support by:

- Coordinating MStC training with ASTM.
- Working with the Interstate Technology and Regulatory Council on training for specific tools and approaches recommended in MStC.
- Preparing and circulating summaries of implementing agency experiences with threat assessments.
- Providing forums for discussions of threat assessments at national conferences and other meetings.
- Providing targeted assistance to implementing agencies.

EPA anticipates working closely with ASTM and interested implementing agencies to provide support for modifying UST cleanup programs and training staff, consultants, and owners on the use of threat assessments. EPA also will engage with partners to gather and share experiences and lessons learned with an eye toward improving the design and implementation of threat assessment processes.

EPA is the primary implementing agency in Indian Country and in coordination with Tribes has begun using this exposure threat assessment approach to identify higher threat UST release sites as well as low-threat sites, which may be suitable for closure. These assessments can also incorporate current and potential exposures unique to each Tribe’s land uses.

Regional offices also will play a role in this effort by coordinating and participating in training programs and supporting targeted assistance projects. UST implementing agencies can contact EPA regional UST program staff with questions. Please visit the EPA UST contacts directory.

Appendix D offers strategies for UST implementing agencies interested in incorporating threat assessment into their UST corrective action programs.

Conclusion

Completing corrective actions to protect human health and the environment at 55,000 open petroleum UST releases, and addressing new releases as they are discovered, poses administrative, financial, and technical challenges for UST programs. To address these challenges, UST implementing agencies are encouraged to use both traditional and innovative approaches. This policy statement builds on our experience with corrective action at UST release sites and the latest scientific understanding. It continues EPA's support of innovative approaches by encouraging regulators to expand use of threat assessments in their programs.

EPA anticipates that threat assessments will enable UST implementing agencies to protect human health and the environment by focusing on high-threat release sites and moving all UST releases towards closure.

Disclaimers

This document does not change or substitute for any law, regulation, or any other legally binding requirement and is not legally enforceable.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government.

Appendix A: UST Cleanup Program Background

Threat Assessment in the UST Regulatory Context

The Solid Waste Disposal Act (commonly known as the Resource Conservation and Recovery Act), as amended, requires implementing agencies to prioritize their corrective actions "to releases of petroleum from underground storage tanks which pose the greatest threat to human health and the environment."[4] Therefore, it is important for implementing agencies to differentiate between releases that pose a significant threat and releases that pose a low threat.

UST implementing agencies funded with Leaking Underground Storage Tank Trust Fund money are required to prioritize addressing petroleum UST releases.[5] They should ensure that:

- Release sites using LTF money are relatively higher priority, and
- Necessary corrective actions proceed at all release sites.

The policy statement's approach of taking action at higher threat releases and resolving low-threat releases is consistent with EPA regulations governing UST corrective action found in 40 CFR 280 Subpart F. EPA's UST corrective action regulations require UST implementing agencies to approve cleanups that will adequately protect human health, safety, and the environment. As described in 40 CFR §280.66, implementing agencies consider several factors when ensuring that plans are adequate to protect health and the environment:

1) The physical and chemical characteristics of the regulated substance, including its toxicity, persistence, and potential for migration,
2) The hydrogeologic characteristics of the facility and the surrounding area,
3) The proximity, quality, and current and foreseeable future uses of nearby surface water and groundwater,
4) The potential effects of residual contamination on nearby surface water and groundwater; and
5) An exposure assessment.

Understanding the site conditions and current and future points of exposure is critical to this process. Implementing these regulations have allowed programs to close approximately one million USTs and complete corrective action at over 500,000 UST releases.

This policy statement aims to address the approximately 55,000 releases are still open. Many of these cases are not progressing toward closure. At some sites the threats are unclear. Some are

[4] RCRA section 9003(h)(3), 42 USC 6991b(h)(3).
[5] *Leaking Underground Storage Tank Trust Fund Corrective Action Cooperative Agreement Guidelines*.

placed in monitored natural attenuation because while the threat is low, one or more of the cleanup goals have not been met. The corrective action remains open, but the only activity is to monitor groundwater concentrations while natural attenuation processes proceed.

Current Scientific and Technical Understanding

Since the inception of the UST corrective action regulations, we have gained significant experience cleaning up release sites. Research studies have improved our understanding of the behavior of petroleum underground. Statistical studies of the thousands of release sites in California's *GeoTracker* database and other databases have shown that contaminant plume behavior is predictable. ITRC's *LNAPL-3 Guide*, University of Glasgow and Shell Global Solution's *GWSDAT*, CONCAWE's *LNAPL Toolbox*, Applied NAPL Science Review's *Exit Strategy Toolkit*, and ASTM's MStC standard reflect some of this newer understanding and best practices for evaluating threats from petroleum UST releases. Our understanding of petroleum behavior has evolved in recent years, including topics such as:

- Natural attenuation patterns, processes, and timeframes.
- How LNAPL gets trapped in finer-grained soils.
- How soluble compounds dissolve out of LNAPL.
- How vapors emanate from LNAPL.
- How petroleum releases in the subsurface reach stability.
- Methods to determine if LNAPL and dissolved phase plume are stable.
- How to predict the distance a typical groundwater plume will travel.

Each topic listed above is elaborated upon in the paragraphs below.

Natural attenuation patterns, processes, and timeframes. Natural attenuation, including biodegradation, occurs at all petroleum release sites. Biodegradation of petroleum occurs both aerobically and anaerobically, and at both the edges and within the plume, reducing the amount of petroleum in the ground. In addition, the more volatile compounds are depleted from the source area and plume more rapidly than the less volatile compounds. As the volatile compounds in petroleum are often the most hazardous, their natural attenuation tends to reduce the threat from a petroleum plume more than the simple reduction in total petroleum mass would indicate.

How LNAPL gets trapped in finer-grained soils. In the subsurface, LNAPL gets trapped in the finer-grained soils and once trapped, becomes stable, meaning it stops spreading laterally. The amount of time needed for LNAPL at UST releases to reach stability depends on the specifics of the release site (type of petroleum, amount of the release, stratigraphy, depth to the water table, and fluctuations in the water table) but occurs relatively quickly. In many cases it is difficult or not possible to remove or degrade the trapped LNAPL with active remedies when excavation is not practicable. Over time it will degrade through natural processes.

How soluble compounds dissolve out of LNAPL. Some of the more soluble compounds dissolve out of the LNAPL into the groundwater and move with the groundwater. However, further plume expansion is limited by biodegradation at the edges of the plume, which is generally aerobic, at the point that biodegradation equals or exceeds the rate of additional dissolved compounds moving with the groundwater. As with LNAPL, the amount of time needed for the dissolved phase plume to reach stability depends on the specifics of the release site but dissolved phase plumes from UST releases generally stabilize within years. For further information on petroleum plume behavior, Table X3.1 in the MStC standard provides a useful consolidation of the many research papers on this topic.

How vapors emanate from LNAPL. Vapors emanating from the LNAPL and dissolved phase plume migrate up through the soil where they are degraded by the soil biota and are converted to methane or carbon dioxide. With distance and oxygen-rich soil the petroleum vapors will degrade. A large data study has established safe screening distances for indoor exposures to petroleum vapors.

How petroleum releases in the subsurface reach stability. Once the LNAPL and dissolved phase plume have reached stability, the contamination and potential for exposure will decrease as long as there is no major disturbance to the hydrogeology and there are no other precluding factors such as preferential pathways.

Methods to determine if LNAPL and dissolved phase plume are stable. A variety of techniques, including those described in the documents and tools cited earlier in this section, may be applicable to assessing the threat posed by the petroleum release. There are numerous methods to determine if the LNAPL and dissolved phase plume are stable and if they will reach receptors, with new techniques continuing to be developed. Concentration-based methods and modeling are available for evaluating vapor and dissolved phase movement at individual release sites.

How to predict the distance a typical groundwater plume will travel. Many studies using data from large numbers of sites have provided an understanding of the typical and maximum distances that dissolved phase plumes reach. These groundwater studies inform decisionmakers about the likely extent of contaminant plumes at UST release sites.

Some UST implementing agencies, informed by these advances in scientific understanding, have closed many petroleum UST release sites with residual contamination. These are low-threat cases where the petroleum is not affecting human or ecological receptors and is unlikely to do so in the future as the petroleum continues to degrade naturally. Appendices X.3 and X.5 in the MStC standard reference these implementing agencies and their approaches.

Appendix B: Relationship of this Policy Statement to ASTM Standards and Prior EPA Directives

This appendix describes how this policy statement relates to the following ASTM standards and EPA Directives:

- ASTM's *E3488-25 Standard Guide for Moving Sites to Closure (MStC) for Petroleum UST Releases*.
- ASTM's *E1739-95 Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (RBCA).*
- OSWER Directive 9610.17, *Use of Risk-Based Decision-Making in UST Corrective Action Programs*, February 24, 1995.
- OSWER Directive 9200.4-17P, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites,* April 21, 1999.[6]

ASTM issued the *Standard Guide for Moving Sites to Closure (MStC) for Petroleum UST Releases (E3488-25)* in 2025. The MStC standard provides a detailed framework for conducting threat assessment at petroleum UST releases and incorporating threat assessments into UST corrective action programs. EPA participated in developing the standard and believes that its technical content is sound and that it is consistent with this policy statement. In addition to threat assessment, the MStC standard includes sections on:

- Determining if the conceptual site model is adequate to assess the threat from an UST release.
- Evaluating and revising corrective actions that are not making adequate progress.
- Overcoming non-technical barriers such as non-responsive owners and denial of access for site assessment.
- Considerations for applying engineering and institutional controls at release sites where residual contamination will remain in place.

The MStC standard includes checklists that summarize the major steps in the MStC process and examples of applications of the framework. It may help UST implementing agencies integrate threat assessment into their corrective action programs.

ASTM's *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (E1739-95) (RBCA)* provides a framework for setting cleanup goals and establishing time frames for addressing releases from petroleum USTs. While threat assessment uses some of the principles that are included in the RBCA process, such as considering the source, pathway, and receptors to determine risk, it is an independent process from RBCA. Threat assessments can be

[6] Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.

performed on UST release sites with cleanup goals that were established by RBCA or by any other process. EPA believes that threat assessments are useful to all UST corrective action programs, whether they incorporate the RBCA approach or not. ASTM's RBCA standard is still in effect and widely recognized as a useful approach to UST release site corrective action.

OSWER Directive 9610.17, *Use of Risk-Based Decision-Making in UST Corrective Action Programs* was developed by EPA's Office of Underground Storage Tanks and issued by its parent office OSWER, which was a predecessor office to OLEM. The directive encourages UST implementing agencies to adopt risk-based decision-making in their UST corrective action programs and identified the ASTM RBCA standard as one possible approach for implementing risk-based decision-making. The directive encourages risk-based decision-making but does not require any specific actions of implementing agencies. This Directive remains in effect and is not superseded by this policy statement. EPA continues to encourage implementing agencies to incorporate risk-based decision-making into their petroleum UST corrective action programs.

OSWER Directive 9200.4-17P, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* seeks to:

> …clarify EPA's policy regarding the use of monitored natural attenuation (MNA) for the cleanup of contaminated soil and groundwater in the Superfund, RCRA Corrective Action, and Underground Storage Tank programs… [as]an alternative means of achieving remediation objectives that may be appropriate for specific, well-documented site circumstances where its use meets the applicable statutory and regulatory requirements.

Among other topics, the Directive outlines:

- Sites where monitored natural attenuation may be appropriate. "MNA is appropriate as a remedial approach where it can be demonstrated capable of achieving a site's remediation objectives within a timeframe that is reasonable compared to that offered by other methods."
- Performance monitoring and evaluation. "Performance monitoring should continue until remediation objectives have been achieved, and longer if necessary to verify that the site no longer poses a threat to human health or the environment."

As discussed in Appendix A, *UST Cleanup Program Background*, advances in understanding the behavior and properties of petroleum at UST releases lend more confidence to using natural attenuation as an effective remedy for petroleum UST releases. Our ability to determine when natural attenuation is an appropriate remedy and when monitoring of natural attenuation is necessary at petroleum UST releases has improved. For sites where the threat of exposure to the release is low, and will remain low while natural attenuation proceeds, implementing agencies may consider whether further monitoring is necessary.

Note that this policy statement only impacts the petroleum UST corrective action aspects of OSWER Directive 9200.4-17P and makes no statement as to its continued applicability to other types of cleanup actions (i.e., Superfund cleanup or RCRA corrective action).

Appendix C: Common Misconceptions about Threat Assessment

There are several common misconceptions about threat assessments, and about identifying releases as low threat, in particular. This section attempts to clear up confusion surrounding threat assessments.

Misconception 1. Threat assessments are a means to justify "no further action" at release sites, regardless of the remaining potential for exposure.

Clarification. Once an UST release is confirmed, the key decision to be made at each stage of the corrective action process is what action is required to protect human health and the environment. Only when it can be determined that all points of exposure have been identified and threats to them managed can a corrective action be closed.

Misconception 2. Decisions to close low-threat sites are incompatible with laws that require restoration of groundwater to pre-release conditions or safe drinking water standards.

Clarification. Depending on the specific requirements of state, territorial, and Tribal laws, closing the corrective action at low-threat sites can be compatible with non-degradation or restoration statutes because petroleum attenuates over time and eventually natural attenuation will restore the groundwater to meet the non-degradation goal. The low threat indicates that no receptors are expected to be affected by the release while the natural attenuation proceeds, and therefore, active remedial measures and monitoring are not needed to protect human health and the environment. The non-degradation goal will be met once the natural attenuation of the contaminants reaches the level required by the statute; meanwhile, active management of the contaminants can cease. In some cases, agencies may choose to use engineering or institutional controls, and those controls may need to be monitored periodically to ensure their continued effectiveness. For example, a site may need to be checked to make sure that new exposure points are not placed too close to the residual contaminants or that the contaminants are not disturbed.

ITRC, ASTM and EPA provide guidance on implementing and monitoring engineering and institutional controls, including:

- *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites* (EPA OSWER 9355.0-89, EPA-540-R-09-001 December 2012).
- *Implementing Institutional Controls in Indian Country* (EPA Office of Site Remediation Enforcement, Office of Enforcement and Compliance Assurance, November 2013).
- *Long Term Stewardship at Leaking Underground Storage Tank Sites with Residual Contamination* (EPA 510-K-17-001, February 2017).

- *Long-term Contaminant Management Using Institutional Controls*, ITRC, 2016.
- ASTM's *E2091 Guide for Use of Activity and Use Limitations, Including Institutional and Engineering Controls*.

If future development creates a new exposure to the residual contaminants before the natural attenuation process is complete, the corrective action case could be reopened and the potential for exposures assessed in light of the development plans.

Misconception 3. Threat assessments are a means of identifying release sites where corrective action can be deferred.

Clarification. Threat assessments generally are intended to move releases to either corrective action or closure, not to identify releases where action can be deferred. This policy statement encourages UST implementing agencies to make corrective action decisions as quickly as possible based on the established threat and focus their resources on corrective actions at higher threat release sites.

Misconception 4. UST corrective action programs must implement all aspects of this policy statement.

Clarification. This policy statement encourages UST corrective action programs to adopt a threat assessment approach, but this is not required. If an implementing agency chooses to develop a threat assessment approach, it is not necessary to include every aspect identified in this policy statement or the MStC standard. Some aspects of threat assessment, such as new techniques to determine the stability of groundwater plumes, can be implemented within the current regulations of most UST implementing agencies. But some programs may need to revise their legislative authorities or regulations to implement aspects of this policy statement, such as allowing release site closure with measurable LNAPL in monitoring wells or allowing the use of institutional controls to control exposures. UST implementing agencies may choose to phase in aspects of threat assessment policies over time.

Misconception 5. Threat assessment replaces the initial response and corrective action process required under the Federal UST regulations.

Clarification. Threat assessment as described in this policy statement can help regulators determine the need for further corrective action, but the assessment does not replace or alter the regulatory requirements to mitigate immediate threats to human health and the environment, to characterize the release site, and to identify actual or potential exposures. Nor do threat assessments replace remediation requirements. Indeed, threat assessments are based on information derived from the release and exposure investigations and require an assessment of potential current and future exposures.

Misconception 6. Threat assessment requires extensive study and additional site investigation.

Clarification. Threat assessments generally do not require extensive studies of site characteristics, cleanup options, or other factors. In most cases threat assessments can be done based on the data that already exists in the release site file. If the data are not sufficient to complete a threat assessment, the threat assessment process will generally point to specific data gaps, focusing future data collection efforts. There are several ways to demonstrate the threat level of release sites using available site data. The threat assessment approach promoted in this policy statement is based on collective experience and knowledge gained from completing cleanups at over 500,000 sites. UST releases have similar contaminants and are governed by similar hydrogeologic and natural attenuation processes.

Misconception 7. Threat assessments and risk assessments are the same.

Clarification. Threat assessments and risk assessments are related, but not the same. Threat assessments examine the current conditions at UST release sites and identify specific sources, pathways, and receptors that could lead to contaminant exposure to human or ecological receptors.

Risk assessment involves determining the probability of potential harm or damage to a receptor from an exposure. Risk assessment is broader than threat assessment because it encompasses both the assessment of threats and their potential impacts on the receptors. Threat assessments do not include the additional step employed in most risk assessment procedures of calculating the probability of harm to a receptor or quantifying that harm. If the threat of a release is assessed to be low, meaning that there is no current exposure to receptors and exposure is not anticipated to occur in the future, then there is no risk of harm to calculate.

Examples of where risk assessments are currently used in petroleum UST corrective action programs include:

- Some implementing agencies set groundwater cleanup goals based on generic risk assessments assuming the type of use of the groundwater at the release site.
- Screening levels in the RBCA process are set to ensure that exposure to a contaminant does not exceed a predefined, acceptable level of risk based on generic exposure scenarios such as residential or commercial/industrial.
- Risk assessment is also used in petroleum UST remediation to design treatment systems for contaminated drinking water.

Appendix D: Recommended Implementation Strategies

UST implementing agencies have flexibility to implement or experiment with threat assessment in various ways. EPA can provide advice and assistance, but decisions on whether and how to proceed are solely within the province of UST implementing agencies. In all cases, the threat assessment must identify if there is adequate protection of human health and the environment. This section provides general advice for implementing agencies as they integrate threat assessments into their UST corrective action programs.

Take an iterative approach.

Implementing agencies may wish to take an iterative approach to incorporating threat assessments into their UST release site corrective action program. Agencies will need to consider their regulatory structures and other mandates. Staff may need to familiarize themselves with threat assessment approaches and concepts.

Agencies may want to conduct pilot projects to test or demonstrate threat assessment effectiveness. After designing a threat assessment process, UST implementing agencies may find it beneficial to run several representative release sites through their proposed process. Such simulations, preferably using release sites that have already gone through corrective action, may help UST implementing agencies identify problems that were not foreseen when the process was being designed and anticipate UST release stakeholders' questions.

Taking an iterative approach can help ensure success of a full-scale program by providing:

- More time to make necessary statutory or regulatory changes, to strategize, and to train staff.
- Evidence of the usefulness and effectiveness of threat assessment.
- Testing ground to work through issues, misconceptions, and implementation logistics before full-scale implementation.
- Valuable lessons learned to incorporate.

Build internal and external support.

UST regulators, tank owners and operators, consultants, lending institutions, and environmental and community interest groups may have concerns about the use of threat assessment in corrective action programs. For example, where a threat assessment might lead to a decision to leave some contamination in place, there may be concerns about liability for the consequences of possible future exposure to such contamination. UST implementing agencies should communicate with interested groups, explain their reasons for wanting to move toward threat assessment, and address concerns that such groups may have. Involving

stakeholders early in the decision-making process about whether and how to use threat assessment will help ensure the long-term success of this approach.

Set clear and transparent processes up front.

UST implementing agencies may need to make decisions about a range of scientific, technical, regulatory, and organizational issues. To minimize confusion, implementing agencies should set and share clear processes and expectations up front. For example, they may:

- Define criteria and data requirements for categorizing the threat posed by release sites.
- Establish screening levels and screening distances that can be used to perform threat assessments, as well as acceptable investigation, fate and transport, and exposure models.
- Specify procedures for conducting threat assessment and the resulting regulatory decisions to require further corrective action or no further action.
- Identify the circumstances, if any, under which UST engineering and institutional controls may be appropriate and whether a post closure review process for those controls is needed.
- Establish program management procedures, such as where and when oversight and review will occur and how intensive they will be.
- Identify ways to measure results of implementing the threat assessment program and ensure that appropriate data are collected. This approach may enable UST implementing agencies to identify opportunities for additional improvements.

Provide adequate and ongoing training.

Before implementing a threat assessment process, and periodically thereafter, UST implementing agency staff, as well as corrective action consultants and contractors, should be trained to ensure that they thoroughly understand the process and how it affects their work. Training in exposure assessment, fate and transport models, the behavior of petroleum, and other scientific and technical areas also may be necessary. Such training, as well as participation in dry runs of the threat assessment process, will be useful not only for UST regulatory staff but also for consultants, contractors, lenders, and other stakeholders. Tank owners and operators may not need in-depth training, but an overview of the threat assessment process may be beneficial. Training may improve owners and operators' oversight and interactions with the consultants and contractors they hire to undertake corrective action at their facilities.

EPA is committed to ensuring that quality training is available to UST implementing agencies that are considering the adoption of a threat assessment approach. In coordination with EPA and the MStC Task Group, ASTM is developing a training program. The training will be designed to help implementing agencies understand threat assessments and corrective action reassessment, and how to overcome non-technical barriers to completing corrective actions. EPA expects this training to be available in at least two configurations:

1. A short seminar for senior program managers considering adopting some or all the MStC framework.
2. A longer, more detailed training that introduces program staff and consultants to the MStC process and works through example release sites. This training will take into account an implementing agency's regulatory requirements.

ASTM will develop training materials and plans to certify instructors who are qualified to provide training.