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OFFICE OF
COMPLIANCE AND ENFORCEMENT

Reply To: OCE-082

MEMORANDUM

SUBJECT: Executing Risk-Based LUST Site Closures in R10 Indian Country

FROM: Rob Rau, Ground Water Unit

TO: Interested Parties

Purpose and Statement of Problem: The purpose of this memo is to provide guidance in executing risk-based leaking underground storage tank (LUST) site closures in Region 10 Indian Country based on human health considerations. It is also intended to promote a consistent decision making process that can address unique site considerations and circumstances. Closing LUST sites that do not meet lookup cleanup concentrations may range from the use of formal risk assessment procedures with the imposition of institutional controls such as deed restrictions, to making a best professional judgment determination that a site does not pose an adverse health risk based on the evaluation of a conceptual site model developed from site-specific data. With this understanding, Region 10 recognizes that between a clean site closure and a comprehensive site-specific risk assessment there is a continuum of activities that could comprise a risk-based closure strategy. In general however, more robust and thorough scientific site evaluations are always preferred, and it is generally not appropriate to close a contaminated site that does not meet cleanup standards simply because it is "good enough" or because it is not practical to do more cleanup. Since few risk-based LUST site closures have been completed at EPA-lead sites, and many questions remain regarding technical implementation and policy decisions, this memo should be regarded as a "living" document, and reevaluated and updated regularly as additional policy decisions are made both regionally and nationally.

Throughout this document, the term *clean closure* refers to a *no further action determination* which results in unrestricted current and future land use at the site. While this typically means that the concentration of chemicals of concern (COCs) in both soil and groundwater are below lookup cleanup values (Tier 1) throughout the site, it may also involve the use of risk assessment procedures (Tier 2 or Tier 3) to derive alternate cleanup values that are met throughout the site. Non-clean closures, or those in which some current or future land use is restricted at the site, will invariably involve the use of some form of institutional control to prevent that restricted use from occurring.

Background: The vast majority of LUST site closures and no further action (NFA) determinations rendered by EPA (both regionally and nationally) have been for "clean closures"

where all soil confirmation and/or groundwater samples have concentrations of COCs that result in unrestricted current and future land use at the site. In most sites involving NFA determinations, sample concentrations will all be below lookup cleanup values, or "Tier 1" cleanup standards. EPA's UST regulations in 40 C.F.R. Part 280 do not identify specific cleanup action levels or risk assessment procedures for use at LUST sites, but rather require that corrective actions be protective of human health and the environment. As a result, EPA typically uses applicable state cleanup standards in Indian Country. EPA also has lookup cleanup values know as Regional Screening Levels (RSLs), formerly known as preliminary Remediation Goals (PRGs), that are also used as Tier 1 cleanup standards. Tier 1 look cleanup values commonly used in Region 10 are summarized below in Table 1.

Table 1. Tier 1 Lookup Values for R10 LUST Site Closures

State/Tribe	Rule	Comments
Idaho	1) *Standards and Procedures for Application of Risk-Based Corrective Action at Petroleum Release Sites* (IDAPA 58.01.24, Table 2); and, 2) Idaho Risk Evaluation Manual (REM), Appendix A (Initial Default Target Levels, IDTLs).	Residential screening (cleanup) values for 18 COCs replaces IDTLs, but both are still commonly used. IDAPA 58.01.24 is for petroleum sites only. The REM is guidance, not law, and applies to a more comprehensive list of COCs.
Oregon	1) *Risk-Based Decision Making (RBDM) for Remediation of Petroleum-Contaminated Sites*; and, 2) UST Cleanup Manual (OAR 340-122-0205 through 340-122-0360).	The RBDM is a September 2003 guidance document, but accompanying Tier 0 lookup tables are updated frequently. Last table update September 2009, and includes values for over 100 COCs. UST Cleanup Manual (May 2009) has lookup values for gasoline & diesel based upon a Soil Matrix Score, but is being phased out of use.
Washington	MTCA Method A Tables (WAC 173-340-900).	Cleanup values for 33 COCs including gasoline, diesel, heavy oils and mineral oils. Intended for use at relatively simple sites such as petroleum LUSTs. Last update November 2007.
Shoshone-Bannock	*Soil Cleanup Standards for Contaminated Properties* (WMA §605(D)(2)). Table A soil lookup values. April 15, 2010.	Based on 2008 San Francisco Bay Area Regional Water Quality Control Board Environmental Screening Levels (ESLs), and EPA Region 9 PRGs. Also includes lookup standards for soil gas and indoor air.
EPA	Regional Screening Levels (RSLs). On-line at http://www.epa.gov/region09/superfund/prg/	These Tier 1 values are updated twice annually by a national EPA workgroup, and include a detailed users guide and an on-line calculator. Formerly known as Region 9 PRGs, these values have been combined with Regions 3 and 6 and are now used Agency wide.

Notes:

- There are currently no UST or LUST sites in Alaska located in Indian Country. However, ADEC LUST cleanup rules are found in Article 2 of the *UST Regulations* (18 AAC 78) and the *UST Procedures Manual* (November 2002). Contaminated site cleanup rules are also contained in Article 3 of 18 AAC 75, *Oil and Other Hazardous Substances Pollution Control*.
- The Nez Perce Tribe is also looking into promulgating cleanup standards for contaminated sites. No other Region 10 tribes have initiated or expressed interest in developing their own cleanup standards

In some instances, Tribes may not want EPA to apply state cleanup standards in Indian Country, especially if they are conducting their own responsible party funded cleanup. Under these circumstances, it may be appropriate to use EPA RSLs to determine when cleanup goals have been achieved. Note that RSLs are not cleanup action levels mandated by law, but rather risk-based screening concentrations. For carcinogens, they are based on a 1E-6 excess individual

lifetime cancer risk. For noncancer chemicals, they are based on a hazard quotient of 1.0. Both are based on standard Superfund residential and industrial exposure assumptions. RSLs can be adjusted based on site-specific exposures and desired ceiling risk/hazard level. As an alternative to using state risk assessment procedures in R10 Indian Country, the ASTM risk-based corrective action (RBCA) standards can also be used, or a site specific risk assessment can be conducted using the Risk Assessment Guidance for Superfund (RAGS) guidance documents.

For LUST sites where it is not practical or possible to perform a clean closure within a reasonable time frame (typically 10-15 years), or to achieve risk-based action levels across the site, EPA must use other approaches to achieve site closure if a secondary goal is to remove the site from our cleanup backlog. Under these circumstances, a non-clean site closure using risk-based corrective action (RBCA) will include certain conditions or restrictions on current or future land uses, and some form of institutional control will generally be required as a means to prevent such uses from occurring. Under this circumstance however, a policy decision needs to be made as to whether it is appropriate to remove the site from our backlog of active LUST sites. This decision may be made in consultation with OUST and OSRE (cleanup enforcement).

Under other circumstances, it may be advantageous for the Region to monitor or "keep an eye on" the site and allow it to remain on our active backlog list indefinitely as a means of managing risk to human health and the environment. Under this scenario, the best outcome may be eventual site cleanup driven by a real estate sale involving bank loans and due diligence. However, due to the low turnover of parcels in many parts of Indian Country may result in cash property transactions with no banks or insurance companies involved. Either way, appropriate state, local and tribal government agencies (and possibly real estate agencies) should be notified, perhaps through a "Current Status" letter, that the subject property is a contaminated site to prevent an unsuspecting buyer with no due diligence research from unknowingly purchasing the land without proper notification. This is the essence of notification as a form of institutional control which is considerably easier and more effective for EPA to implement as compared to a deed restriction.

Another potential problem that may arise in removing a non-clean or conditionally closed site from the LUST backlog list is that it may not appear in database searches as a contaminated piece of property. For example, R10 often gets FOIA requests involving our active LUST sites in Indian Country, and it is believed the requestors sometimes repackage and sell this information to other groups or individuals conducting Phase I Environmental Assessments. Consequently, misinformation could result that would impede the due diligence process by removing such a site from the LUST backlog list where contamination is still present that presents unacceptable risks for certain current or future land uses. Under these circumstances, the *Institutional Controls* section of the USTRAC database should be used along with checking the *Conditional*, rather than *Clean* Closure box.

Formal methods and procedures for executing risk-based decision making (RBDM) and RBCA in Region 10 are summarized below in Table 2. Many of the state RBDM guidance manuals include computational spreadsheets that are updated on a regular basis as toxicity information changes on EPA's Integrated Risk Information System (IRIS) database. In addition, the EPA RSL website includes a calculator for site-specific toxicity and/or exposure calculations. This is

very convenient because the mathematics can become fairly complicated in higher tiers of risk evaluation, and someone not familiar with the calculations may be prone to mistake. While the computational spreadsheets are typically updated frequently and posted on the Web, the accompanying printed guidance document itself is typically out of date.

Table 2. Summary of Documented Risk-Based Decision Making Procedures in R10

Entity	Reference	Comments
Idaho	1) *Standards and Procedures for Application of Risk-Based Corrective Action at Petroleum Release Sites* (IDAPA 58.01.24, Table 2); and, 2) *Idaho Risk Evaluation Manual* (REM) with Tier 1 and Tier 2 Evaluations. The REM is dated July 2004, but computational spreadsheets are updated regularly on the IDEQ web site to calculate Tier 1 and Tier 2 cleanup levels. Contact Bruce Wicherski at IDEQ for more information.	IDAPA 58.01.24 established the framework for RBCA and references the REM for specific details. The REM is guidance. Computational spreadsheets can be run forward (to calculate cleanup levels) or backwards (to calculate risk).
Oregon	Similar to Idaho, the *Risk-Based Decision Making (RBDM) for Remediation of Petroleum-Contaminated Sites* is a 2003 publication but computational spreadsheets are updated regularly on the ODEQ web site to calculate Tier 1 and Tier 2 levels.	Computational spreadsheets can be run forward (to calculate cleanup levels) or backwards (to calculate risk).
Washington	MTCA (WAC 173-340) Method B is the universal cleanup method using RBDM in Washington State. Computational spreadsheets available on Ecology's web site.	Cleanup levels are conservatively based on young child exposures. MTCA method B for petroleum provides for using TPH fractions for which toxicity values are provided. Use of MTCA B may not result in higher cleanup levels as compared to MTCA A lookup values. Acceptable risk under MTCA for multiple chemicals/exposures is 1E-5, but is 1E-6 for individual chemicals for residential exposures. For this reason, the use of other RBDM guidance other than MTCA for RBCA sites in Washington may yield higher target cleanup values. MTCA B can be useful for heavy end petroleum products where there is no leaching, or in areas where fuel spills have not impacted groundwater.
EPA	1) *EPA Risk Assessment Guidance for Superfund* (RAGS); 2) *Risk-Based Decision Making For Petroleum Releases at Underground Storage Tank Sites in Indian Country – Guidance Manual* (Final Draft, May 2000); and, 3) *OSWER Directive 9610.17: The Use of Risk-Based Decision Making in UST Corrective Action Programs* (March 1996). If the RSL database is used by altering toxicity values or exposure assumptions, that would represent a Tier 2 or Tier 3 procedure.	R10 OEA risk assessors can assist in site specific risk assessments using the RAGS as guidance and also guidance specific to OEA R10. The EPA 2000 Indian Country RBDM document was patterned after the ASTM standard, but was intentionally never finalized. This document is very similar to the Idaho REM and the Oregon RBDM documents, and also contains computational spreadsheets but they have not been updated since 2000. The OSWER Directive encourages the use of RBCA at LUST sites "based on the application of sound science and common sense that are flexible and cost effective".
Shoshone-Bannock	*Soil Cleanup Standards for Contaminated Properties* (WMA §605(D)(2)). April 15, 2010.	Chapter 4, *Site Specific Standards*, discusses the use of tier 1 and tier 2 risk assessments, and the development of conceptual site models.
ASTM	1) *Standard Guide for Risk-Based Corrective Action* (Designation E2081-00, Reapproved 2010); and, 2) *Standard Guide for Risk-Based Corrective Action Applied at*	ASTM standards are not federal or state regulations, but rather consensus standards and protocols commonly accepted in the industry that can be voluntarily followed. The EPA 2000 Indian Country

Table 2. Summary of Documented Risk-Based Decision Making Procedures in R10

Entity	Reference	Comments
	Petroleum Release Sites (Designation E1739-95, Reapproved 2010)	RBDM guidance was based upon the ASTM standard.

Notes:
- There are currently no UST or LUST sites in Alaska located in Indian Country
- There are currently no tribal RBDM guidance document in R10

Policy & Implementation Decisions:

The RBDM process is flexible and can be customized to suit site specific needs and requirements. In addition, it is sufficiently generic and similar among all of the above referenced guidance documents that the following discussion applies to all of them. The customization and execution of the RBDM process requires that numerous policy and implementation decisions be made. These implementation decisions will vary with regional and local differences in land and groundwater use, cultural and behavioral practices, and the physical characteristics of the area. The following list identifies some of the important policy and technical considerations that may be evaluated during the implementation of the RBDM process:

1. Land Use: Both current and potential future land use should be evaluated. Land use may be residential, agricultural, commercial, industrial, recreational or special cultural land. Land use should also be evaluated for on-site and off-site areas. An example of an off-site land use evaluation may involve groundwater use at some distance downgradient where contamination plumes are potentially impacting those resources. Tier 1 cleanup levels and RSLs are derived assuming unrestricted current and future land use.

2. Groundwater Use and Classification: Groundwater may be classified as either potable, potentially potable, non-potable, or other. EPA may establish different target risk levels for different groundwater uses such as a drinking water source, recreation, industrial, agricultural, etc. States may also have designated sensitive areas such as sole-source aquifers, well-head protection areas, recharge areas and wetlands that may require special protection. For example, in Washington State, low well yield (< 5 gpm), unsuitable background geochemistry (>10,000 mg/l TDS), or temporal instability (i.e., seasonality) can be used to demonstrate a non-potable source. Tribes may also have special use designations.

3. Receptors: Human receptors to be evaluated in the risk calculations may include residential (child and adult), commercial, industrial, construction worker, or other. Ecological receptors may also be evaluated.

4. Exposure Pathways: Human exposure pathways to be evaluated in the risk calculations may include exposures from air (indoor and outdoor), soil (surface and subsurface), surface water, and groundwater. Different states or tribes may decide on the specific exposure pathways to be evaluated under Tiers 1, 2 and 3; and what defines surface and subsurface soil. A detailed conceptual site model based on site-specific data should be prepared for each site identifying current and future complete, potentially complete, and

incomplete chemical exposure pathways.

5. Target Risk Level: The RBDM process generally requires that the target risk levels be specified for both carcinogenic and non-carcinogenic health effects. Risks estimated from exposures to different COCs may be evaluated separately, or added together. Target risk for individual carcinogens is typically set to 1E-6. For combined exposures to all carcinogens and routes of exposure, a lifetime individual excess cancer risk of either 1E-5 or 1E-4 is acceptable under a reasonable maximum exposure. Although EPA and different states and tribes have differing policies or rules regarding target risk levels, they generally range between 1E-4 and 1E-6. As previously stated, 40 CFR 280 does not specify a target risk range either but rather says cleanups must be protective of human health and the environment. The Superfund program typically uses 1E-4 to trigger the need for a remedial action, but 1E-6 is the point of departure once a remedial action is triggered. Also, MTCA B requires 1E-6 for individual chemicals for unrestricted land use scenarios. An acceptable hazard index/quotient for non-carcinogens is typically set to 1.0 representing a concentration in media that is not expected to result in adverse affects.

6. Point of Exposure/Point of Compliance: States and tribes may require that cleanup goals be established at a specified point of compliance (POC) or point of exposure (POE) located at or near the site. Target risk levels may have to be met at all points across the site (typical for soils), or at specific POCs or POEs (typically wells). Hypothetical POEs can also be established, along with the required number of compliance wells and their monitoring frequency. For groundwater, POCs are typically located along the downgradient site boundary and the base of the aquifer. If a site is going to be clean closed under a NFA determination, it must meet cleanup levels for unconditional current and future land use (typically residential) for soil and groundwater across the site.

7. Total Petroleum Hydrocarbon (TPH): EPA, states and tribes may accept the use of surrogate or component chemicals (or a hybrid model) to represent certain TPH fractions, and/or require the analysis of individual COCs for use in the risk calculations. Target TPH concentrations may also be selected as an indicator of gross levels of petroleum contamination that should not be exceeded.

8. Representative Concentrations: Methods to estimate representative concentrations of site contaminants may include utilizing the maximum observed concentration, or a commonly accepted statistical treatment (e.g., upper confidence level of the mean) of the entire data set, or a subset if it believed to be more representative.

9. Fate and Transport Parameters: When calculating risks under a Tier 1 evaluation, generic conservative values of fate and transport parameters are generally utilized in conjunction with various analytical models to calculate risk levels. States and tribes may develop their own conservative set of default fate and transport parameters that represent typical hydrogeologic and soil conditions in their area, and select certain models that best suit their needs. Higher tiered evaluations generally substitute site specific fate and transport parameters for the conservative values inherent in the lower tier evaluation.

10. Data Requirements: States and tribes may require samples be collected at a specified location and frequency in order to properly characterize the nature and extent of contamination at a LUST site.

11. Institutional Controls and Deed Restrictions: EPA categorizes institutional controls into four basic types: 1) proprietary controls (including restrictive covenants and deed restrictions); 2) governmental controls (including zoning and well drilling restrictions); 3) enforcement tools (including compliance orders, consent decrees and permits); and, 4) informational devices (including notifications). Institutional controls, particularly proprietary controls, can be controversial, costly, and difficult to implement and monitor, and there is little or no history of EPA using proprietary controls at LUST sites. A much easier but also less permanent solution involves informational devices in the form of notifications have been used on three recent risk-based closures in R10 Indian Country (i.e., Bovey Oil, Former Arrowhead Truck Plaza, Millers Garage, and Bell Equipment; see Appendix A).

12. Community and Tribal Acceptance: Public participation is required for each confirmed release that requires a Corrective Action Plan (CAP), and notification to the public must be designed to reach those members of the community that are directly affected by the release (40 CFR 280.67). However, CAPs are typically required only for larger LUST sites such as when a groundwater contamination plume migrates off-site, and are not necessary for corrective actions such as simple PCS removals.

    Proprietary and governmental institutional controls can be among the most controversial aspects of a final remedy, and can be difficult to implement due to community concerns as well as logistical reasons. Because most forms of institutional controls will have direct affects on the community at large, it is anticipated that some form of public participation will be necessary for all site closures involving institutional controls. This is consistent with OSWER's Community Engagement Initiative launched in March 2011. Tribal acceptance with a risk-based site closure is also important, and it may be difficult to move forward on closing a LUST without it.

    Region 10 should reaffirm with OUST a commitment to a baseline level of public outreach and involvement for any RBCA site that leaves contamination in place above Tier 1 levels. This is consistent with the Administration's goals of Community Engagement and transparency.

    In March 2012, OUST published *Guidelines For Tailoring Community Engagement To Circumstances At Leaking Underground Storage Tank Sites* on the community engagement webpage at http://www.epa.gov/oust/communityengagement/index.htm

    In the document, the following guidelines are presented:
    - A reaffirmation that community engagement at leaking underground storage tank sites is dependent on site circumstances;
    - Examples of enhanced community engagement activities;

- Four scenarios outlining common community questions/concerns and suggestions for possible community engagement activities;
- Reference to OUST's Community Engagement web page (including the Toolbox) for additional resource material; and
- provide examples of state public participation policies and guidance.

Barbara Grimm-Crawford is the community involvement lead for OUST, and may be contacted for additional information or assistance.

13. EPA's Justification for No Further Action (NFA) Determination or No Further Environmental Investigation or Cleanup Required (NFEI/CR): It is critical that EPA base its contaminated site cleanup decisions on sound science that is protective of human health and the environment. This entire process must be thoroughly documented and transparent. In R10, we have recently reserved the phrase *no further action (NFA) determination* to apply only to LUST site closures that meet or exceed Tier 1 cleanup standards at all POCs. When contamination remains on site exceeding Tier 1 cleanup standards that results in conditional current or potential future land use, R10 has used the phrase *no further environmental investigation or cleanup required (NFEI/CR)*. The reason for this distinction is that the term NFA has taken on a special meaning in common usage or vernacular to imply that the site is "clean" for unrestricted land use. Policy decisions must be made as to whether it is appropriate to remove these sites from our backlog list, and this decision can be made in consultation with OUST.

Discussion: There must be a scientific, risk-based rationale to execute a site closure or a NFEI/CR determination where soil and/or groundwater concentrations do not meet lookup cleanup values. It is generally not sufficient to simply say that residual contamination remains on the property, but that it is not practical or cost effective to conduct additional cleanup. A common example of this scenario may be where soil contamination extends under building foundations or busy roadways, or where groundwater contamination persists for many years or occurs at great depth. Although such closure decisions have been made to varying degrees in the past, there must be a scientific justification for this decision. However, under some circumstances it may be appropriate to close a site without any level of quantitative risk assessment. For example, a qualitative risk evaluation may be performed by preparing a conceptual site model based on site-specific data and concluding that there are no complete or potentially complete exposure pathways and therefore risk risks need not be quantified under the current land use scenario. This is an example of decision making using best professional judgment. Similarly, for some COCs such as total xylenes, the MTCA A cleanup level for soil is 9 mg/kg with the protection of groundwater for drinking purpose being the risk driver. The MTCA B cleanup level under section 740 is 1.6E+4 (16,000) mg/kg considering only the direct contact pathway of incidental ingestion. In this way, knowledge of the potentially complete exposure pathways through careful preparation of a conceptual site model justifies utilizing a higher cleanup value. In other words, 16,000 mg/kg for soil xylene would be acceptable if in fact there is no soil to potable groundwater pathway.

Despite this, there is considerable flexibility built into the RBDM framework that can assist EPA in closing problematic sites. Since EPA is the UST regulatory authority in Indian Country, and

each tribe is a sovereign entity unto itself, Region 10 is not obligated to use specific state guidance or rules simply because the reservation in question happens to be located within a state's boundaries. In Washington State for example, the use of MTCA B may not always result in the derivation of higher numeric cleanup values as compared to those from the Method A lookup tables, especially if benzene is a COC. For this reason, Region 10 may choose to use RBDM guidance from Idaho or Oregon, or conduct a site-specific risk assessment with support from the R10 Office of Environmental Assessment (OEA). In any case, when using MTCA as a guidance in Indian Country, EPA and the tribe should be free to make adjustments as deemed necessary to be protective so long as it complies with federal and tribal rules.

The cleanup process can be made more flexible if the property owner or other affected parties is (are) willing to accept deed restrictions or similar forms of institutional controls. In this situation a site can often be closed with contamination remaining in the ground. This however raises a host of other questions and issues that are discussed further below. MTCA also allows for costs to be taken into consideration when selecting a remedy, but only when a formal cost-benefit analysis has been performed. Flexibility can also be built into the remedy by establishing alternate points of compliance rather than meeting cleanup goals over the entire site.

Public participation in LUST CAPs is required under 40 CFR 280.67 where notification must be "designed to reach those members of the community directly affected by the release and the planned corrective action". Accordingly, some form of public notice and participation will generally be required for all non-clean LUST site closures such as a RBCA, or any form of institutional control that has the potential to directly affect the community at large (either now or in the future). This is consistent with OSWER's Community Engagement Initiative (CEI). As described in the regulations however, such public participation may be as simple as letters to individual households or personal contacts by field staff, or it may involve public meetings and consultation. In addition, because closing a LUST site under a NFEI/CR and allowing contamination to remain in place has the potential to be controversial, it will generally be easier in the long run to notify the public of such an action, allow for a reasonable comment period (typically 30 days), and schedule a public meeting if sufficient interest is expressed. Similarly, it will be difficult to proceed with a risk-based site closure unless the Tribe is in agreement with this approach so consultation should begin as soon as it is known that there is a possibility that a clean site closure is not practicable.

Institutional Controls: As noted above, institutional controls, particularly proprietary controls, can be controversial and difficult to implement and monitor, and there is little history of EPA executing these remedies for LUST sites in Indian Country. Below is a list of implementation issues to be considered when deciding whether or not to require institutional controls in a risk-based closure:

- Community and tribal acceptance and implementation
- Who imposes, monitors, and enforces it through time
- Willingness of state, local and tribal governments to go along and participate as necessary
- Level of ORC involvement

- Will site be removed from active LUST backlog list? Keeping a site on the cleanup backlog list could serve as a defacto IC where it would otherwise be difficult to implement such a measure. Can remove site from backlog but complete the *Institutional Controls* section of the Underground Storage Tank Reporting and Compliance (USTRAC) database so stakeholders know the site is conditionally closed but still a contaminated piece of property.
- Is an Order or Consent Decree necessary to transfer deed restrictions to a hypothetical future property owner or does the deed restriction itself accomplish this? In general, the deed restriction itself will accomplish this
- Can a deed restriction or other restriction be applied only to a future land use? (generally not)
- Are simple notifications to local and state governments of specific future restrictions and/or closure contingent on current land use conditions (as was done for several recent risk-based closures on the Nez Perce Reservation) adequate? If so, this should be done with public notice/participation.
- Recognizing that sites with small amounts of residual contamination should not require the same level of effort in implementing and maintaining IC's as a large site with extensive groundwater contamination.
- Leaving contamination in place as part of a risk-based LUST site closure can be at odds with the Brownfields redevelopment paradigm.
- According to the current information in USTRAC, approximately 45 LUST sites have been conditionally closed in R10 over the years. Some of these closure decisions date back to the early 1990's when protocols and procedures were not established as they are currently. EPA may want to revisit some of these closure decisions to see what the circumstances were, and possibly consider reopening some of them.

Tribal sovereignty and EPA jurisdictional limits the requirements that EPA can place on a tribe or tribal member. For example, a corrective action order cannot require ICs because other parties who are not subject to the order must act to implement the IC. An example would be placing a deed restriction on land owned by a tribe, or enacting a law/ordinance according to the tribe's governing procedures. Proprietary ICs are the most difficult to implement and least useful because recording involves the Department of Interior, Bureau of Indian Affairs, and because land in Indian country is not transferred, and therefore the land records are not searched often. Idaho DEQ has created an environmental covenant template and an annual compliance reporting form that could help stream line this process and both can be downloaded from their web site. Governmental and informational ICs are more effective, results and cost wise, in Indian country. An agreement between EPA and the tribe is the best method to implement ICs. This goes hand-in-hand with consultation, and thus it is necessary to engage the tribe early in the process to create a viable IC plan.

An institutional control work group for Indian Country was established by OECA in 2011 to review Agency policy and provide guidance for EPA employees in implementing IC's in Indian Country. The final work product of this group is a handbook titled *Implementing Institutional Controls in Indian Country* (November 2013). Contact Kimberly Fediantz or Cecilia De Roberts at EPA HQ (OSRE) for more information.

Outline For Risk-Based LUST Sites Closures in R10: Provided below is a general outline for how a site assessment may progress to an eventual risk-based closure, with or without institutional controls. This process is show graphically in Figure 1. The OCE Director signs all LUST site closure letters whether they be clean or risk-based. Note that NFA determinations are rendered only under circumstances of unconditional current or potential future land use. Where certain land use conditions are not allowed due to an unacceptable risk, then the site is closed out with a NFEI/CR determination.

- Initial Site Assessment

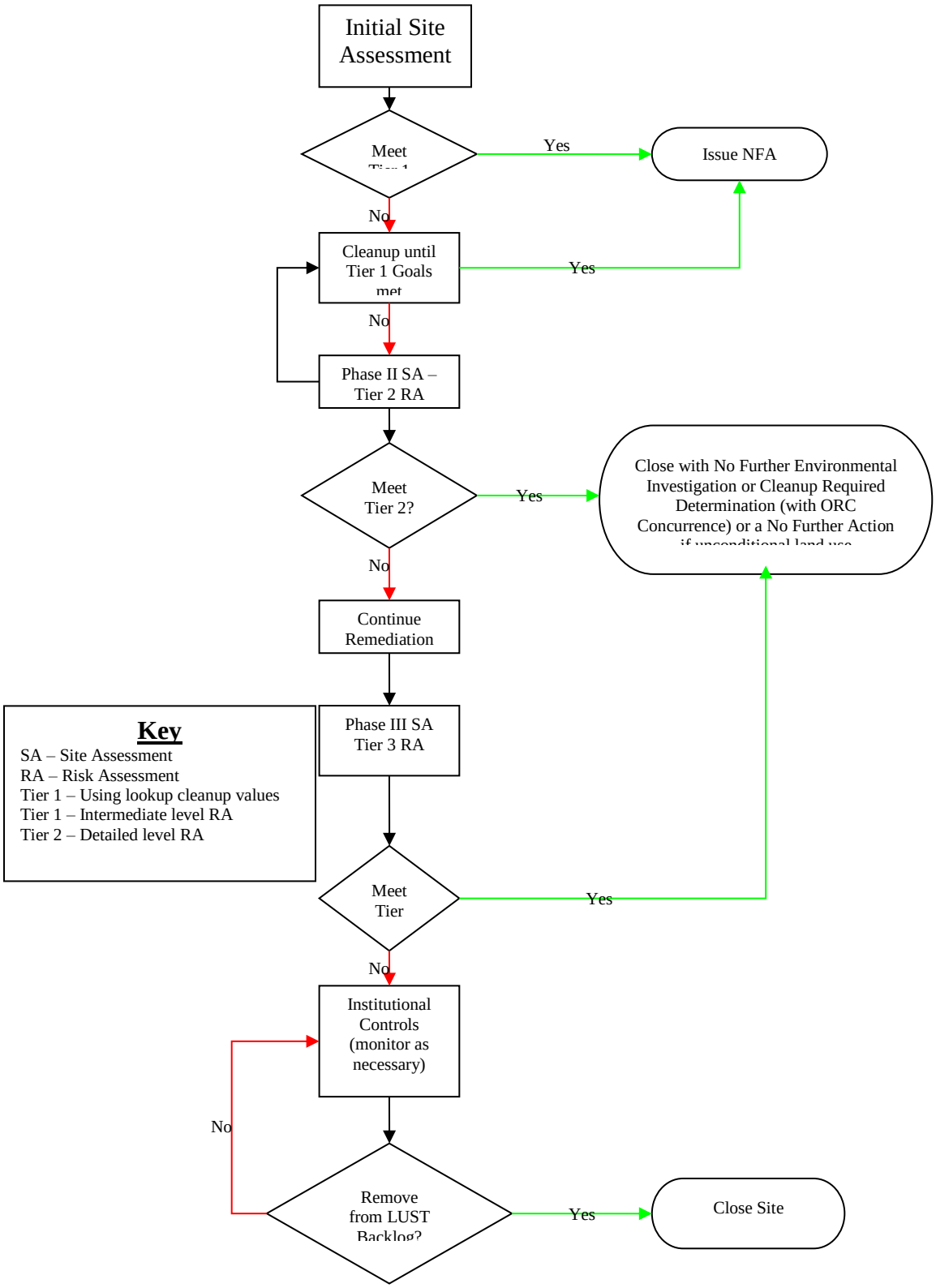
- Site Concentrations Meet Tier 1 lookup values ?
    - Yes - Close Site with NFA Determination
    - No - Cleanup up to Tier 1 lookup then Close Site with NFA Determination

- Not Practical to Cleanup to Tier 1 lookup values ?
    - Perform Phase II Site Assessment and Tier 2 Risk Assessment

- Site Concentrations Meet Tier 2 Cleanup Levels ?
    - Yes – Close Site With a (with ORC concurrence)
    - No:
        - Continue Cleanup to Meet Tier 2 Levels (with ORC concurrence & public participation), OR
        - Execute a Tier 3 Risk Assessment (typically accompanied by a Phase III Site Assessment)

- Site Concentrations Meet Tier 3 Cleanup Levels ?
    - Yes – Close Site (with ORC concurrence & public participation)
    - No:
        - Continue Cleanup to Meet Tier 2 Levels (with ORC concurrence), OR
        - Evaluate Institutional Controls as a Means to Close Site (with ORC concurrence), OR
        - Keep Site on LUST Backlog and Monitor

Figure 1. Process Flowchart: Risk-Based LUST Site Closures in R10 Indian Country



Key Implementation Decisions for Non-Clean LUST Site Closures:

In summary, a list of key implementation decisions regarding a non-clean LUST site closure is provided below:

1. Level of Risk Evaluation:
   - Site specific risk assessment using the EPA RAGS
   - Quantitative risk assessment using state guidance such as the Idaho REM, Oregon RBDM, MTCA B, or ASTM standards
   - Qualitative risk evaluation using a conceptual site model and best professional judgment

2. Institutional Controls and/or Restrictions:
   - Proprietary controls (e.g., restrictive covenants and deed restrictions)
   - Governmental controls (e.g., zoning and well drilling restrictions)
   - Enforcement tools (e.g., compliance orders, consent decrees & permits)
   - Informational devices (e.g., deed notices and other notifications)

3. Methods for Managing Site Risk:
   - Clean closure
   - Risk-based closure (with or without institutional controls)
   - Keep on backlog (possibly in perpetuity) and monitor

4. Public Relations & Tribal Acceptance:
   - For all non-clean site closures, some level of public involvement will be necessary
   - Tribe must be consulted on all non-clean closures

5. Which Guidance documents or Risk Assessment Procedures will be Used?
   - What level of involvement does the Tribe want to be included in making these decisions

6. What Current & Future Land Uses will be Considered?
   - Will enforcement measures be used to limit future land use?

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APPENDIX A
RECENT EXAMPLES OF NON-CLEAN LUST SITE CLOSURES IN R10

Provided below is an outline and brief description of recent non-clean LUST site closures that have been executed in R10. Some of these involved formal risk assessment procedures while others were closed through a qualitative evaluation using best professional judgment to conclude that the site presented no unacceptable risk. They are described in descending order from the most robust level of risk evaluation to the least.

A. Former Bovey Oil Facility (2400039): EPA contractor Bristol performed a Tier 2 risk evaluation (RE-2) in accordance with the procedures outlined in the Idaho REM, and EPA issued a NFEI/CR determination under the current land use on December 6, 2010. Provided below are bulleted outline points regarding the site along with an excerpt from the closure letter that illustrates the final determination:

- Environmental site assessment began in 1999. In 2006, 10 USTs were removed from the site along with 564 cubic yards of petroleum contaminated soil (PCS). An estimated 1,800 cubic yards of PCS remain in the subsurface at concentrations exceeding Tier 0 lookup cleanup values (Idaho IDTLs).
- Approximately 10 feet of fine grain soil overly basalt bedrock at the site. Shallow groundwater at the site occurs in discontinuous lenses and lacks temporal stability.
- A Tier 1 and Tier 2 risk assessment were performed at the site using the Idaho REM as guidance.
- While some future land uses and construction scenarios were determined to pose an unacceptable risk, the site was closed without the use of institutional controls or deed restrictions in favor of notifying interested parties. Interested parties that were copied on the closure letter included the Nez Perce Tribe, IDEQ, Idaho Transportation Dept., Lewis County Assessor's Office, Lewis County Planning & Zoning Office, and the City of Craigmont.

Using this risk-based approach, EPA has determined that no further environmental site assessment or cleanup is necessary at the former Bovey Oil property in order to protect human health under the current land use. However, contaminated subsurface soil and groundwater are still present beneath the site, especially in the northeast corner, and it will be necessary to prevent direct (i.e., ingestion or dermal contact) human contact (most likely by a construction worker) with these materials should future excavation on the property extend to depths greater than three or four feet. In addition, contamination likely extends under adjacent portions of Division Street, and State and local authorities should be aware of this situation should future road construction extend to these depths. Future excavation on or adjacent to the former Bovey Oil facility should be supervised by a qualified environmental professional and with the informed consent of the EPA.

B. Former Arrowhead Truck Plaza (360001): On behalf of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Martin S. Burck Associates, Inc., performed a risk-based corrective action and LUST site closure in a manner consistent with the Oregon Administrative Rules (OAR) 340-122-0205 through 340-122-0360 as presented in the Oregon Department of Environmental Quality (DEQ) guidance documents titled *UST Cleanup Manual* (revised January 2008) and *Risk-Based Decision Making for Remediation of Petroleum Contaminated Sites* (RBDM, revised September 2009). The EPA uses both of these documents as a guide for

addressing underground storage tank (UST) releases in Indian Country in Oregon. Provided below is an outline of the EPA's understanding of the facts regarding the risk evaluation at site:

- A CSM was developed to identify impacted media, transport mechanisms, routes of exposure, and receptors for each pathway of concern. Potential receptors applicable to this site were evaluated by researching land use zoning, current site and surrounding property use, potential future use, and the hydrogeology of the site. The following human exposure pathways were considered complete, and were included in the risk evaluation: 1) soil ingestion, dermal contact, and inhalation for the occupational, construction, and excavation worker; and, 2) vapor intrusion into buildings, and volatilization to outdoor air for the occupational worker. The site and surrounding area are zoned either Commercial Development (C-D) or Exclusive Farm (AG-1), and no zoning changes are expected in the future. The Planning Department of the CTUIR maintains exclusive zoning authority over lands located within the Reservation boundary, and the Tribe considers the current C-D zoning at the site to be the "highest and best use" for the

  property. Consequently, while residential exposure pathways were not considered in the risk evaluation, the remote chance of this occurrence cannot be dismissed at some time in the future. Similarly, and as discussed below, neither groundwater nor the soil leaching to groundwater pathways are complete for human exposure at the former Arrowhead Truck Plaza site.

- Near surface soils at the site consist of approximately 15 feet of silty sands overlying silty clay. Neither groundwater nor any signs of groundwater such as oxidation or saturated soils were encountered at the maximum explored depth of 33 feet in May 2009 when approximate seasonal high groundwater levels are to be expected. Based upon the results of a beneficial water use determination, along with a survey of nearby water wells, it appears that groundwater in the vicinity of the site is first encountered at depths of approximately 50 to 60 feet, and is present under artesian conditions with a potentiometric surface at approximately 15 feet. Consistent with this information, there appears to be a pronounced and ubiquitous confining layer beneath the site and the surrounding area resulting in artesian conditions that would preclude the infiltration of surface water from above. Furthermore, site characterization data indicate that the maximum vertical extent of PCS at the site is limited to the soil above the confining layer. Accordingly, based on the artesian groundwater conditions, the extent of the cleanup excavation, and the limited extent of residual PCS remaining, the *soil leaching to groundwater pathway* is not complete, and groundwater exposure pathways were not considered during the risk evaluation.

- Contaminants of potential concern (COPCs) at the site were identified and retained if any single sample concentration exceeded the most stringent RBC, which was the soil leaching to groundwater exposure pathway. At the former Arrowhead Truck Plaza site, COPCs included gasoline range hydrocarbons, naphthalene, benzo(a)pyrene, and dibenzo(a,h) anthracene. However, concentrations of these COPCs only exceeded RBCs

for the leaching to groundwater pathway which was determined to be an incomplete exposure pathway. Consequently, none of these COPCs were carried through the risk evaluation, and all remaining concentrations of COPCs in soil, as determined through confirmation sampling, were below applicable RBCs for completed exposure pathways. Concentrations of remaining COPCs in site soils also exceed the RBC for the vapor intrusion into a residential building exposure pathway. While this exposure does not currently exist, and is prohibited under current zoning law, the possibility of zoning changes in the future cannot be discounted.

- Overall, direct contact with soil (through ingestion, dermal contact or inhalation) for the occupational worker was the risk-driver at the site, and resulted in the lowest applicable RBC at the site for a completed exposure pathway. For each of the COPCs, the RBC that would have resulted in an action level (i.e., additional cleanup) were as follows: gasoline – 13,000 mg/kg, naphthalene – 23 mg/kg, benzo(a)pyrene – 0.27 mg/kg, and dibenzo(a,h) anthracene – 0.27 mg/kg (September 2009 RBDM update). Of the 19 confirmation samples collected from the area surrounding the former tank pit excavation, each of them contained concentrations of COPCs less than these most stringent applicable RBCs.

After evaluating this risk-based approach for site closure, the EPA has determined that no further environmental site assessment or cleanup is necessary at the former Arrowhead Truck Plaza site in order to protect human health or the environment under the current land use scenario. This determination is made pursuant to Title 40, Code of Regulations, Part 280, Subparts E and F. However, subsurface PCS remains in the vicinity of the former UST basin, and should future zoning changes be considered for this property allowing residential housing, additional site assessment and/or cleanup action may be necessary. In this event, the EPA should be notified of any possible zoning change to the property.

C. Millers Garage (2400125) and Bell Equipment (2400125): These two sites are very similar, were discovered on the same day, and are located around the corner from each other in downtown Nezperce on the Nez Perce Indian Reservation, Idaho. The Idaho Transportation Dept. (ITD) assumed responsibility for the site assessment and cleanup of these LUST sites that were discovered during a major road improvement project in 2009. Although the ITD had no historical connection to either property, their consultant, Strata Inc., performed a Tier 1 risk evaluation (RE-1) in accordance with the procedures outlined in the Idaho REM, and EPA issued a NFEI/CR determination under the current land use in October 2010. Provided below are bulleted outline points regarding the site along with excerpts from the closure letter that illustrates the final determination:

- Both LUST sites were discovered beneath downtown city sidewalks during a major State road construction project. Tanks and PCS were removed, but residual amounts of obvious PCS were left in place adjacent to building foundations due to stability concerns. The excavations were immediately backfilled following the initial site assessment due to tight construction schedules, and the large expense of placing crews on standby.
- A Tier 1 risk assessment was performed at the site using the Idaho REM as guidance. Risk was calculated for the sites using the software module that assumes groundwater concentrations are protective of off-site exposures resulting from exposure via pathways other than direct ingestion (i.e., drinking). The results of this evaluation showed that

there were no unacceptable risks at the site to human health or the environment from COCs.

- In the unlikely event that future water supply wells were to be constructed in the downtown area, a separate software module was used to calculate the distance from the site where the risk from direct ingestion would become acceptable given the current levels of contamination. This distance was calculated at 165 feet for the Millers Garage site and 350 feet for the Bell Equipment site.
- Interested parties that were copied on the closure letters for notification purposes included the Nez Perce Tribe, IDEQ, ITD, Idaho Dept. of Water Resources, Lewis County Assessor's Office, Lewis County Planning & Zoning Office, and the City of Nezperce.

A conceptual exposure model was developed to identify impacted media, transport mechanisms, routes of exposure, and receptors for each pathway of concern. The following exposure pathways were considered complete, and were included in the risk evaluation: 1) the indoor inhalation of vapors from contaminated groundwater and subsurface soils for non-residential receptors; and, 2) vapor/particulate inhalation, dermal contact and accidental ingestion by construction workers. Since the site is located in the central business district of downtown Nezperce, residential receptors were not evaluated as part of the risk assessment.

Results from the RE-1 model run using the Groundwater Protection 2 module show that site risk and hazard indexes associated with COCs in soil are acceptable with respect to all complete exposure pathways under current land use scenarios (note that acceptable cumulative risk for carcinogens is 1 x 10^{-5}, and acceptable hazard index for non-carcinogens is 1.0).

After evaluating this risk-based approach, EPA has determined that no further environmental site assessment or cleanup is necessary at the former Miller's Garage property in order to protect human health or the environment under the current land use scenario. However, small volumes of contaminated subsurface soil remain adjacent to the building foundation at 402 Oak Street in Nezperce, Idaho. Should this building be torn-down and the site excavated at some time in the future, it is likely that additional PCS will have to be removed. Similarly, in the event that water supply wells are constructed within a distance of approximately 165 feet of the site, additional site characterization work should be performed to assess groundwater quality in the area. In this event, both EPA and the Idaho Department of Water Resources should be contacted prior to initiating work. This 165 foot distance was calculated by Strata by executing the Groundwater Protection Option 1 module of the RE-1 model which assumes future drinking of on-site groundwater.

<u>D. U.S. Coast Guard Cape Flattery Lighthouse – Tatoosh Island (4080014):</u> Tatoosh is a small rocky island with little or no soil profile located in the Pacific Ocean several miles offshore of Cape Flattery on the Makah Indian Reservation, Washington. In 1998, the Coast Guard removed partially buried USTs along with small amounts of associated PCS. However, residual amounts of PCS remained adjacent to, and beneath a historical Coast Guard building, and environmental work has been idle since 1999. In March 2011, EPA closed this LUST site under a NFEI/CR determination for the current land use scenario using the following justification. No formal or quantitative risk evaluation procedures were used in this determination.

- Tatoosh Island is uninhabited with no potential human receptors as ascertained from evaluation of the conceptual site model (best professional judgment).
- There is no local source of potable water.
- Thin veneers of unconsolidated surface material overlie bedrock.

- Tremendous logistics of executing work on the island where the operation of heavy equipment and helicopters would disturb migratory birds and marine mammals.
- Additional work would undermine historic building foundations and remove vegetation that would denude areas of concern.

Provided below is an excerpt from the March 17, 2011, closure letter:

During a recent file review, the U.S. Environmental Protection Agency (EPA) found documentation of an underground storage tank (UST) removal and associated remediation at the above referenced facility, which had not been previously assessed or closed in our records. EPA reviewed this documentation and has determined that no additional environmental investigation or cleanup of petroleum released from the UST formerly located on the property is required under current land use. However, this letter serves as notification that petroleum contaminated soil (PCS) still remains in the subsurface beneath portions of the site. Should future land use activities include excavation and/or construction into these contaminated materials, additional cleanup or institutional controls will be necessary to limit direct human exposure to petroleum related contaminants. In making this determination EPA evaluated the following site related documents:

D. Federal Aviation Administration (FAA) – Auburn, Washington (4090004): The FAA operates a facility within the boundaries of the Muckleshoot Indian Reservation in Auburn, Washington. In 2007, two USTs were permanently closed by removal when a release was discovered. Small amounts of PCS were excavated, but residual amounts were left in place immediately adjacent to a building so as not to jeopardize the integrity of the structure. Site soils were investigated to a total depth of 15 feet, where neither groundwater nor native soils were encountered. In April 2010, EPA closed this LUST site under a NFEI/CR determination for the current land use scenario. No formal or quantitative risk evaluation procedures were used in this determination (best professional judgment). Provided below is an excerpt from the closure letter:

Based on a review of local topography and hydrology, it is estimated that shallow groundwater is present beneath the site at a depth of 30 to 40 feet, and flows south/south east where it discharges to the White River located approximately 500 feet downgradient. Between the site and the river, there are no groundwater receptors such as wells or springs. While it is considered likely that some residual diesel range contamination is still present adjacent to the building foundation, this material does not appear to present a threat to either human or ecological receptors under the current land use.

Based upon the information cited above, EPA has determined that, at this time, the release of petroleum products from this UST system into site soils no longer poses a threat to human health or the environment. Therefore, EPA is issuing a determination that no further environmental investigation or cleanup is necessary at this site under Title 40, Code of Federal Regulations, Part 280, Subpart E and F.

APPENDIX B
HISTORICAL PERSPECTIVE ON RBDM FRAMEWORK

Historically, the focus of state corrective action programs at LUST sites has been to reduce the amount of contaminants present at the site with the ultimate goal of achieving background, or very low concentrations such as method detection limits or Maximum Contaminant Levels (MCLs). Such aggressive cleanup strategies have resulted in large financial expenditures to remediate petroleum contaminated soil and groundwater across the country. In response to the needs expressed by industry and regulatory agencies to reduce the cost of LUST corrective actions while still achieving the goal of protecting human health and the environment, ASTM developed a standardized approach to RBDM with the 1994 publication of the *Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM ES 38-94). This document was modified in 1995, and approved as a full ASTM Standard (E 1739-95). In 1996, EPA issued OSWER Directive 9610.17 entitled *Use of Risk-Based Decision Making in UST Corrective Action Programs* which supported the ASTM standard, and encouraged states to adopt its use and implement its procedures at LUST sites. Despite the OSWER Directive, few risk-based LUST site closures have been executed in Indian Country since 1996. As noted above in Table 2, the EPA Indian Country RBDM guidance document is based on ASTM Standard E 1739, with a specific focus on corrective action at LUST sites located on tribal land.

The principle difference between RBDM and traditional approaches towards LUST cleanup is that risk-based decisions are dictated by the current and potential future land use scenarios and risks posed by a site, and corrective action goals are based on reducing these risks to some low, acceptable level. This may be achieved by the reduction of contaminant concentrations through active on-site remediation, but may also involve options such as allowing chemicals to remain in place, using institutional controls to prevent exposure, site monitoring, or implementing remediation by monitored natural attenuation. Overall, RBDM is a process that UST regulatory agencies can use to:

- Focus site assessment and data collection activities
- Categorize or classify sites
- Determine appropriate initial response based on site classification
- Establish cleanup goals
- Determine what, if any, further action is necessary at the site
- Decide on the appropriate level of oversight necessary for cleanups conducted by UST owners/operators
- Decide on appropriate institutional controls

When RBDM methodologies are applied to corrective action at UST sites, the approach is commonly referred to as risk-based corrective action (RBCA). Although technically RBCA applies only to risk-based programs that follow the ASTM's tiered approach, common usage applies it to all risk-based corrective actions. The RBCA process typically comprises several tiers of increasingly sophisticated levels of data collection and analysis that substitute for

conservative assumptions inherent in a lower tier analysis or cleanup values from lookup tables. After each tier evaluation, the user and/or the regulatory agency assesses the results and determine the next course of action. Actions to be taken typically include a NFA determination, remediation to generic risk-based screening levels (RBSLs) or site-specific target levels (SSTLs), or evaluation at a higher tier which requires additional data collection.