




**Montana
Remedial Alternatives Analysis
Guidance for
Petroleum Releases**

Draft
April 2018

	Department of Environmental Quality Waste Management and Remediation Division Guidance Document	Number:	DEQ-WMRD-RAA-1
		Original Effect. Date:	April 2013
		Revision No.:	1
Document Type:	Technical Guidance		
Resource Contact:	Supervisor of Petroleum Tank Cleanup Section	Review Schedule:	Annual
Originating Unit:	Petroleum Tank Cleanup Section	Last Reviewed:	April 11, 2018
Remedial Alternatives Analysis of Petroleum Releases			

Purpose:	The purpose of this document is to describe the objectives, expectations, and detailed items necessary for a remedial alternatives analysis (RAA) of a petroleum release to meet requirements in state and federal laws; these include a RAA work plan, a release closure plan (RCP), and a RAA report of the work, data, results, and recommendations for remediation work to resolve the release.
Scope:	This guidance applies to petroleum products and constituents of petroleum products released into the environment from petroleum storage tank systems that are regulated under the Petroleum Storage Tank Cleanup Act (§75-11-301 et seq.) or the Montana Underground Storage Tank Act (§75-11-501 et seq.) and administrative rules promulgated thereunder. Accordingly, this guidance is applicable to petroleum releases defined by Administrative Rules of Montana (ARM) 17.56.5; and the requirements for investigation, cleanup, and compliance monitoring under ARM 17.56.6. This guidance supersedes all previous versions of guidance addressing a RAA of petroleum storage tank releases.

Revision Date	Revision Description
April 11, 2018	Extensive update to previous RAA guidance including the following: removed subsection numbering; reorganized and revised text; and replaced RA matrix table with Part-3 and Part-4 of Release Closure Plan (RCP). The following sections and pages were added: RCP, overview, objectives, expectations, document review schedule and revision tracking, and title page.

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Referenced documents available at DEQ’s website:

- Montana Risked-Based Corrective Action (RBCA) Guidance for Petroleum Releases
- Montana Remedial Investigation (RI) Guidance for Petroleum Releases
- Montana Remedial Alternatives Analysis (RAA) Guidance for Petroleum Releases
- Montana Release Closure Plan (RCP) for Petroleum Releases
- Montana Vapor Intrusion (VI) Guidance
- Montana Groundwater Sampling Guidance

Remedial Alternatives Analysis (RAA) Guidance

Montana Department of Environmental Quality (DEQ)
Petroleum Tank Cleanup Section (PTCS)

Overview

This DEQ guidance describes the objectives, expectations, and requirements for a remedial alternatives analysis (RAA) to comply with Montana and federal law that address remedial cleanup (cleanup) plans for petroleum tank releases (Release). These include specific items for a RAA work plan and detailed items for a RAA report. A Release in this guidance is defined by Administrative Rules of Montana (ARM) 17.56.5 and includes all reportable leaks, spills, and overflows of petroleum or petroleum products from petroleum storage tank (PST) systems including but not limited to underground storage tanks (UST), aboveground storage tanks (AST), piping, sumps, and dispensers.

This RAA guidance assumes that a remedial investigation (RI) has been completed for the Release in accordance with the Montana Remedial Investigation Guidance for Petroleum Releases. However, the RAA may also be completed as tasks within a RI; and in that case this RAA guidance is used to supplement the RI guidance. The terms ‘work plan’ and ‘report’ used in this guidance refer to either the RAA work plan and report or the RI work plan and report depending on whether the RAA is separate project or conducted as tasks within the RI project.

ARM 17.56.605 lists requirements for owners and operators (O/Os) to consider cleanup alternatives, prepare a cleanup plan for petroleum-contaminated soils and groundwater, prepare a compliance monitoring plan, and implement the cleanup and monitoring plan upon DEQ’s approval. O/Os are required to investigate the Release prior to preparing a cleanup plan. A completed remedial investigation (RI) is expected to fulfill this requirement. ARM 17.56.605(2) states:

In order to prepare the cleanup plan, owners and operators must properly evaluate and interpret the field and analytical results of the site or remedial investigation to define the extent and magnitude of free product, adsorbed phase product, dissolved phase plume and vapor phase product.

O/Os are required to consider cost, performance, reliability, implementation, safety, and effects on public health and the environment when selecting cleanup alternatives. ARM 17.56.605(3) states:

The owners and operators must screen and select cleanup alternatives to develop a matrix evaluation of cleanup alternatives which considers cost, performance, reliability, implementation, safety, and effects on public health and the environment. Information on all cleanup alternatives, with an explanation of why any alternative was selected, must be included in the cleanup plan. Cleanup alternatives may include, but are not limited to, the following types of action:

- (a) take no further action;*
- (b) excavate the contaminated soil and/or treat and/or dispose of the same;*
- (c) in-place soil treatment;*
- (d) product recovery;*
- (e) groundwater removal and treatment;*
- (f) groundwater gradient control (hydrodynamic);*
- (g) vapor control measures;*
- (h) enhanced biodegradation;*
- (i) drinking water supply replacement;*
- (j) relocation of affected residences and/or businesses; and*
- (k) establishment of a petroleum mixing zone in accordance with ARM 17.56.607.*

ARM 17.56.605(6) requires the cleanup plan to include a plan and schedule for compliance monitoring to evaluate the effectiveness of cleanup activities.

Objectives

The RAA objectives for each Release are to screen and select appropriate remedial (cleanup) alternatives based on the results of the completed RI; evaluate and compare the cleanup alternatives; and recommend a site-specific cleanup alternative to DEQ for approval prior to initiating a cleanup work plan (WP).

Expectations

DEQ expects the O/O of a PST system – including properties that historically had a PST system (Facility) – associated with a Release to accomplish the following:

- Obtain professional environmental consulting service to plan and conduct a RAA; the consultant represents the O/O and should be experienced with successful investigations, cleanups, and resolutions of petroleum releases.
- Meet with the O/O's consultant and DEQ's project manager to discuss the Release; determine whether the RAA is part of an RI or if the RAA is a separate stand-alone project; plan work required to complete a RAA based on the RI results; and develop a plan to cleanup, monitor and resolve the Release.
- Prepare and submit a RAA WP for DEQ's review and approval if it is a separate stand-alone project; otherwise include RAA-specific tasks in the RI WP.
- Conduct the RAA according to a DEQ-approved WP and maintain contact with DEQ. Recommend and discuss WP modifications required to achieve the RAA objectives. DEQ will approve agreed upon WP modifications.
- Submit a comprehensive RAA report that includes a completed Release Closure Plan.

The RAA should be conducted using current scientific and engineering principles, technology, and methods to complete with a reasonable degree of certainty all the following:

- Update the Facility history from the RI report to include relevant information concerning the current and historical property use and the physical and legal aspects of the property that may affect the Release, its impacts to human health and the environment, or its investigation, cleanup, and monitoring.
- Update the background of the Release from the RI report to include petroleum sources and previous and ongoing cleanup work of petroleum release(s) at the Facility and adjacent properties.
- Detail the locations, extent, and type(s) of petroleum impacts to receptors from the RI report that the cleanup alternatives are expected to remediate. Maps, cross sections, boring/well logs, and tables summarizing laboratory analytical data that illustrate or demonstrate the petroleum impacts can be adapted from the RI report.
- Select remedial (cleanup) alternatives appropriate for the Release and Facility based on the detailed results of the RI.
- Develop a compliance monitoring plan for each selected cleanup alternative to evaluate the effectiveness of the cleanup.
- Evaluate the selected cleanup alternatives based on these criteria: cost, performance, reliability, implementation, safety and effects on public health, and the environment; and determine which alternative would be most appropriate for the release and provide effective cleanup methods to protect human health and the environment.

- Document why the proposed cleanup alternative was selected including site-specific effectiveness for protection of human health and the environment, and reliable methods to close or resolve the Release.
- Propose a cleanup alternative to DEQ for discussion and approval.
- Identify issues and obstacles that interfere with achieving the RAA objectives; promptly discuss issues with DEQ's project manager; and recommend appropriate modifications to the WP that will ensure the RAA objectives are met.
- Complete a Release Closure Plan using the DEQ-provided form.
- Prepare and submit a RAA report to DEQ.

Remedial Alternatives Analyses Work Plan and Report Procedures

The WP and report expectations discussed in this guidance and detailed below address the issues and expectations for most petroleum releases whether the RAA is a separate project or conducted within a RI project. Use of this guidance will facilitate the following: selection and review of cleanup alternatives and compliance monitoring methods appropriate for the site-specific petroleum impacts on public health and the environment; and recommendations for effective cleanup and monitoring methods; and reliable closure pathways to resolve the Release.

O/Os and their consultants are encouraged to contact DEQ's project managers to confer on draft work products as they are being prepared for the RAA, clarify any portion of a WP request that is not clearly understood, and propose site-specific modifications to WP tasks necessary to meet RAA objectives. DEQ will work with the O/Os and their consultants to define the additional WP tasks and expectations. Only DEQ can approve modifications to the WP tasks and report expectations in this guidance.

DEQ will use this RAA guidance to review submitted WPs and reports. DEQ's approval of the modifications is required before the work is completed, not after. O/Os and their consultants may proceed with WP tasks prior to DEQ's approval of the WP; however, there is a risk of work completed prior to DEQ's approval might result in methods, data, or information not being approved after-the-fact and additional or different work being required.

RAA Work Plan Process

When DEQ requests a RAA, the O/O and their consultant will prepare a WP in accordance with the expectations for a RAA (refer to WP Expectations detailed below) and submit the WP to DEQ for approval. DEQ may also provide site-specific guidance to the O/O for additional items to be included or excluded in the RAA.

DEQ will review and approve the WP if it meets the detailed RAA WP expectations listed below and site-specific guidance provided by the DEQ project manager. The O/O will be notified of DEQ's approval and a deadline to have the work outlined in the WP completed and a report submitted to DEQ. DEQ will determine a reasonable deadline based upon severity of risks posed to human health, safety, and the environment, the amount of prior work completed, and other relevant factors.

The O/O and their consultant are expected to communicate with DEQ regarding recommendations to modify the WP to better achieve RAA objectives and about any issues that are not clearly understood regarding completion of the WP.

RAA Report Process

DEQ expects the RAA report (or the RAA section of the RI report) will clearly and comprehensively document the results of the evaluation and comparison of prospective cleanup alternatives and compliance monitoring methods appropriate for the Release. Upon completion of WP tasks, the O/O

and their consultant should document the results of the RAA in accordance with the RAA report expectations below and site-specific guidance provided by the DEQ project manager. The results of all WP tasks, results, conclusions, recommendations, a completed Release Closure Plan, and all supporting data should be included in the RAA report. DEQ will evaluate the submitted report based on the detailed RAA report expectations listed below; if DEQ determines additional information, data, analysis, or corrections are required to meet RAA objectives, DEQ will notify the O/O and their consultant.

DEQ will review the O/O's submitted RAA report, recommendations, cleanup plan, and compliance monitoring plan; and will approve the plans after determining that it will adequately protect human health, safety, and the environment. DEQ's review and approval must consider the following factors (ARM 17.56.605(5)) as appropriate:

- Physical and chemical characteristics of the regulated substance, including its toxicity, persistence, and potential for migration.
- Hydrogeologic characteristics of the facility and the surrounding area.
- Proximity, quality, and current and future uses of nearby surface water and groundwater.
- Potential effects of residual contamination on nearby surface water and groundwater.
- Exposure assessment that identifies routes by which receptors may be exposed to contaminants and estimates contaminant concentrations to which receptors may be exposed.
- Information assembled during initial response, investigation, and/or cleanup of the release.

Standardized WP and Report Formats Are Not Applicable to all Remedial Alternatives Analyses

The standardized WP and report formats discussed in this guidance are available for use at selected release sites; however, they may not address the needs of every release. O/Os should conform to standardized formats in this guidance whenever possible to facilitate review of documents and to ensure adequate information will be collected to make proper decisions to safeguard human health and the environment.

When an O/O and their consultant determine non-standard site-specific WPs and/or reports may be necessary, they will clearly describe and propose to DEQ additional tasks needed and use as much of the standardized WP and report formats as possible. Only DEQ's project manager can approve modification to the WP and report formats in this guidance or the use of site-specific WPs and reports.

DEQ will request, identify, and require the appropriate WP and report formats to be used in the work plan request and will verify the report format in the approval letter. Any change to the requested, identified, and required WP and/or report will have to be pre-approved by DEQ. O/Os are encouraged to contact DEQ's project manager to clarify any portion of a work request they do not fully understand or to confer on draft work products as they are being prepared.

Evaluation Criteria for Cleanup Alternatives

This section describes criteria to assist owners and operators (O/Os) and their consultants to prepare a cleanup plan for petroleum-contaminated soils and groundwater. Administrative Rules of Montana (ARM) 17.56.605(3) requirements include the following: O/Os must screen and select cleanup technologies to develop a matrix evaluation of cleanup alternatives; the evaluation must compare prospective cleanup alternatives based on specific criteria – cost, performance, reliability, implementation, safety, and effects on public health and the environment. ARM 17.56.605(6) requires the cleanup plan to include a plan and schedule for compliance monitoring to evaluate the effectiveness of cleanup activities.

The methods, reasoning, results, and recommendations of this evaluation of cleanup alternatives are expected to be detailed in either a remedial alternatives analysis (RAA) report or a remedial investigation (RI) report as well as summarized in the Release Closure Plan Part 3 (Evaluation of Cleanup Alternatives) and Part 4 (Compliance Monitoring).

Evaluation Criteria

The required evaluation criteria for comparison of prospective cleanup alternatives are: cost, performance, reliability, implementation, safety, and effects on public health and the environment. Guidance for use of these criteria in evaluating cleanup alternatives is as follows.

1. Cost

Expectation for each cleanup alternative: provide the alternative's known or estimated cost(s). DEQ expects that the estimated costs will include a dollar amount based on the results of the remedial investigation, the location, local conditions, and the consultant's experience and best judgement. The estimated costs are not intended to be design-level values; however, these estimates should be sufficiently accurate to allow meaningful comparisons of remedial technologies. Estimated cost(s) include the total anticipated costs of operation, maintenance, and compliance monitoring.

Regardless of cost differences, to be selected the cleanup alternative must compare favorably to other cleanup alternatives based on the other evaluation criteria.

2. Performance

The performance of each cleanup alternative can be measured by how effectively it will achieve cleanup requirements. Cleanup requirements can be divided into two broad categories: protection of human health and the environment; and compliance with environmental requirements specific to the cleanup methods, petroleum contaminants, and location of the petroleum-contaminated soils and groundwater. When comparing cleanup alternatives, O/Os should consider these criteria separately.

a. Protection of Human Health and the Environment

Expectation for each cleanup alternative: determine and state whether the alternative is protective of public health, safety and welfare, and the environment. Each alternative should attain a degree of cleanup and control of petroleum contaminants that assures protection of public health, safety and welfare, and of the environment. The RAA must describe how each evaluated cleanup alternative protects public health for current and anticipated property uses. For instance, the cleanup alternative may include soil removal to cleanup levels that are protective of both the groundwater and future residential users based on a site-specific risk analysis. Another cleanup alternative might include replacing contaminated well water by

connecting an affected residence to a community water supply; the drinking water provided to the residence would be protective of current and future residents.

b. Environmental Requirements Specific to Cleanup Methods, Contaminants, Location

Expectation for each cleanup alternative: determine and state whether the alternative complies with each of the three types of environmental requirements: cleanup method-specific, contaminant-specific, and location-specific. The RAA should include a description of applicable and relevant state and federal environmental requirements and evaluate how well each proposed cleanup alternative will attain compliance.

Cleanup method-specific requirements are those that are triggered by the performance of a certain activity as part of a cleanup alternative. These include both regulatory and feasibility considerations.

- Examples of regulatory considerations include but are not limited to the following: confirmation sampling and solid waste considerations associated with excavation and disposal of contaminated soil; air emissions from a vapor- extraction system; permits of disposal of liquid and solid waste; third party access agreements and right-of-ways.
- Examples of feasibility considerations include but are not limited to the following: pilot tests for remediation systems; and any sampling or treatability studies that will be required before or during implementation of the proposed cleanup alternative. The O/O should conduct the majority of the sampling and treatability studies necessary for the cleanup alternative prior to submittal of the RAA to ensure that adequate information will be available to indicate that the cleanup alternative is appropriate.
- Contaminant-specific requirements are those that establish an allowable level or concentration of a hazardous or deleterious substance in the environment. Examples include Water Quality Bulletin #7 (WQB-7) promulgated under Montana's Water Quality Act, which lists maximum concentrations of petroleum constituents in groundwater and surface water; and risked-based screening levels (RBSLs) for petroleum constituents in soil and groundwater detailed in Montana's Risked-Based Corrective Action (RBCA) Guidance for Petroleum Releases.
- Location-specific requirements are restrictions on the cleanup alternative solely because the property is in a specific location or the cleanup alternative affects specific types of areas. Location-specific requirements relate to sites with potential historical, cultural, or ecological significance, or sites located near wetlands, floodplains, surface water, endangered species habitat, or migratory bird habitat.

3. Reliability

Expectation for each cleanup alternative: determine and state whether the alternative is effective and reliable in the short-term and the long-term. Short-term reliability includes assurances that the cleanup would not result in a further release of contamination or an increase in the risks posed during the cleanup. Short-term adverse effects may include air emissions or mobilization of contaminants into groundwater or surface water via runoff.

The RAA should also evaluate whether each cleanup alternative is effective and reliable in maintaining acceptable risk levels on a long-term basis. Assuring long-term effectiveness may require institutional controls (e.g., restrictive covenants) and assurance that property usage will not change so that closure decisions based on site-specific conditions remain applicable. For example, petroleum-impacted groundwater may require a petroleum mixing zone that includes institutional

controls restricting future use of a former gas station as a residence, school, day care center, or construction of a building with basement.

4. Implementation

Expectation for each cleanup alternative: determine and state whether the alternative can be implemented and the ease or difficulty of implementation in comparison to the other proposed alternatives. Cleanup alternatives that include impracticable components cannot be selected. For example, a soil-vapor extraction system may be a proven effective remedial technology, but is limited to certain types of petroleum products, soil, and stratigraphy. Implementation of proposed cleanup alternative must be compared. For example, razing a building to excavate petroleum-impacted soils may be impractical; whereas, an excavation may be practical in an undeveloped field or parking lot.

5. Safety

Expectation for each cleanup alternative: determine and state whether the alternative exposes the public to safety hazards during its implementation. The RAA should also discuss what measures would be taken to mitigate safety hazards during implementation of each cleanup activity. For example, working in or near a busy highway can cause safety hazards to cleanup workers and motorists. This hazard could be mitigated by implementing a traffic control plan approved by the Department of Transportation. Other examples of cleanup safety hazards include operation of heavy equipment, open excavations, reactivity of chemicals, discharge of vapors, etc.

6. Effects on public health and the environment

Expectation for each cleanup alternative: determine and state whether the alternative mitigates exposure risk to public health, safety and welfare, and the environment. Describe how each cleanup alternative reduces the levels of contaminants to which humans and ecological receptors are exposed or threatened. Describe how each proposed cleanup alternative will meet DEQ's cleanup levels and/or standards. Alternatively, risks may be mitigated with actions that limit or remove exposure pathways. For example, replace water supplies or implement institutional controls that restrict land use.

7. Other Considerations

Other considerations that may influence selection of cleanup alternatives may include, but are not limited to changes in site use or timeframe to complete cleanup. Describe how these other considerations influence cost, performance, reliability, implementation, safety, and/or effects on public health and the environment. One example would be property redevelopment that includes the demolition of buildings may provide an opportunity to excavate previously inaccessible petroleum-impacted soil. Site redevelopment may influence associated costs, reliability, and implementation of potential cleanup methods. A second example may be as follows: enhanced biodegradation and confirmation monitoring have similar costs to monitoring of natural attenuation for several years; however, enhanced biodegradation requires less time to achieve cleanup goals. The shorter timeframe to achieve cleanup goals may influence performance and effects on public health and the environment.

Cleanup Alternatives Comparison

The RAA should include report text and a matrix evaluation that provide a comparison of the proposed cleanup alternative to the other reasonable alternatives based on the criteria specified in ARM 17.56.605(3). The text in either the RAA or RI report should provide a description of each cleanup alternative and an explanation of why each alternative was considered. Include a discussion regarding how each alternative would or would not meet each of the evaluation criteria and the compliance monitoring necessary to evaluate the effectiveness of each cleanup method. Determine

which of the cleanup alternatives best meet the evaluation criteria. Recommend a site-specific cleanup method and compliance monitoring plan.

The RAA matrix evaluation is presented as Part 3 of the Release Closure Plan (Evaluation of Cleanup Alternatives) and Part 4 of the Release Closure Plan (Compliance Monitoring). An updated Release Closure Plan (below) for the site is a necessary component of both the RI and RAA reports.

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan							(7 Mar 2018)
for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases							
Part 3: Evaluation of Cleanup Alternatives							
Consultant: 0		Date: 1/01/1900		DEQ PM: 0			
Facility Name / Address: 0							
Facility ID: 0		Release: 0		WP ID: 0			
Administrative Rules of Montana 17.56.605(3) requires screening and selection of cleanup methods to develop a matrix evaluation of cleanup alternatives. A cleanup plan requires information on all alternatives and an explanation why any alternative was selected.		Enter appropriate site-specific Cleanup Methods that are based on RI results & CSM					
		No Action*	e.g. Excavation	e.g. Excavation & ORC	e.g. SVE & AS	fill-in as needed or leave blank	fill-in as needed or leave blank
Evaluation Criteria	Performance	Estimated Costs					
	Protective of Human Health & Environment (e.g. residences, utilities, water supply, future use)						
	Method-specific regulatory requirements (e.g. disposal of impacted soil & water, access agreements)						
	Method-specific feasibility requirements (e.g. pilot tests, treatability studies)						
	Contaminant-specific requirements (e.g. method achieves soil & GW RBSLs & DEQ-7 standards)						
	Location-specific requirements (e.g. potential historical, cultural, or ecological significance, or site near wetlands, floodplains, surface water, endangered species / migratory bird habitat)						
	Reliability -- Short Term						
	Reliability -- Long Term						
	Implementation Issues & Limitations						
	Safety Issues						
	Effects on Public Health and Environment (includes Receptors)						
	Other site-specific criteria & issues:						
Advantages of Cleanup Method:							
Disadvantages of Cleanup Method:							
Est. Years to Complete Cleanup Method:							
Cleanup Recommendations:							
Information & Data Gaps:							
Recommendations and comments:							

* Note: Cleanup technologies may be removed or added as appropriate for each Release; however, the 'No Action' alternative must be evaluated for comparison at every Release.

Compliance Monitoring

ARM 17.56.605(6) requires the cleanup plan to include a plan and schedule for compliance monitoring to evaluate the effectiveness of cleanup activities. Compliance monitoring must continue for a period of at least two years after completion of cleanup activities specified in the cleanup plan, or another reasonable time period approved by DEQ. Results of compliance monitoring will be evaluated by DEQ on a site-specific basis and compared to cleanup goals that should be outlined in the cleanup plan.

Determine a site-specific compliance monitoring plan for each of the evaluated cleanup alternatives. The monitoring plans should be based on results of the RI, specific to each cleanup alternative, and include consideration of the following:

- Confirmation sampling including sample collection methods, location, frequency, analytical parameters, and quality assurance/quality control procedures.
- Installation of borings and monitoring wells
- Groundwater monitoring (frequency, number of wells, number of years).
- System operation, optimization, and monitoring (frequency and number of years).
- Vapor monitoring.
- Receptor monitoring.
- Waste management.
- Other site-specific monitoring requirements.
- Method(s) to evaluate interim results and optimize cleanup.
- Estimated years to complete all monitoring.
- Estimated costs for all monitoring and system operation.

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan (7 Mar 2018)								
for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases								
Part 4: Compliance Monitoring reference: MT DEQ Remedial Alternatives Analysis (RAA) Guidance for Petroleum Releases								
Consultant: 0		Date: 1/0/1900		DEQ PM: 0				
Facility Name / Address: 0								
Facility ID: 0		Release: 0		WP ID: 0				
Compliance & Operation Monitoring Methods to Evaluate Effectiveness of each Cleanup Alternative Listed in Part 3								
Administrative Rules of Montana 17.56.605(6) requires the cleanup plan to include a plan and schedule for compliance monitoring to evaluate the effectiveness of cleanup activities.		No Action*	e.g. Excavation	e.g. Excavation & ORC	e.g. SVE & AS	fill-in as needed or leave blank	fill-in as needed or leave blank	fill-in as needed or leave blank
Evaluation of Cleanup	Confirmation Sampling							
	Borings/ Monitoring Wells (MWs)							
	GW Monitoring (freq., wells, years)							
	System O/M (frequency & years)							
	Petroleum Vapor Monitoring (freq., locations, years)							
	Receptor Monitoring							
	Waste Management							
	Other site-specific monitoring:							
	Method(s) to Evaluate Interim Results and Optimize Cleanup:							
	Est. Years to Complete all Monitoring:							
Estimated costs for O/M & monitoring:								
Closure	Estimated Total Years to Closure:							
	Natural Attenuation Trends:							
	What currently prevents Closure?							
	Is this a PMZ Closure Candidate?							
	Other:							
Information & Data Gaps:								
Recommendations and comments:								

* Note: Cleanup technologies may be removed or added as appropriate for each Release; however, the 'No Action' alternative must be evaluated for comparison at every Release.

Remedial Alternatives Analysis – Work Plan Expectations

This section describes items to assist owners and operators (O/O) and their consultants to meet the minimum requirements for a remedial alternatives analyses (RAA) work plan (WP) by Montana and federal laws for petroleum storage tank (PST) systems including properties that historically had a PST system (Facility). This guidance provides O/Os and their consultants with the basic expectations for a RAA WP before it will be approved by DEQ. It is the O/O's responsibility to confer with the DEQ project manager to determine if, and what, modifications to the WP will be necessary based on potentially changing conditions at the Facility. The WP expectations discussed in this guidance and detailed below address the issues and expectations for most petroleum releases (Release) whether the RAA is a separate project or combined with the remedial investigation (RI).

DEQ will evaluate the WP against the detailed RAA WP requirements listed below; and site-specific guidance provided by the DEQ project manager; and if found to adequately address all requirements the WP will be approved. If the WP is not approved, DEQ will notify O/Os and their consultant of deficiencies. Under normal circumstances the RAA should be completed by a mutually agreed upon date; however, the timeframe will be based upon the severity of risks the release poses to human health, safety, and the environment.

Section 1: Cover Letter

Cover letter should be no longer than one page and include the following:

- Date.
- Responsible party's name and contact information.
- Contact person's name and information (if different from above).
- Subject line with the following information:
 - Remedial Alternatives Analysis Work Plan for the petroleum release at (facility name, street address, town), Montana (zip code).
 - DEQ Facility ID (number), Release (number), and Work Plan (number).
- Introductory paragraph containing reference to DEQ's request for a work plan and general scope of work to be conducted.
- Consulting company and contact information (if not on letterhead).
- Name of person who prepared the work plan.

Section 2: Objectives of RAA

State the site-specific objectives for the RAA. Include a discussion of information regarding the Facility history, Release background, RI results, and current conditions at the Facility and surrounding area that would influence selection of potential cleanup alternatives.

Section 3: Work Plan Maps

Maps in the WP are expected to be to-scale and use currently available base maps. Maps should have a north arrow, scale, map legend, and a title including site name. Expectations for maps are detailed along with examples in DEQ's Remedial Investigation (RI) Guidance for Petroleum Releases.

- Location map – preferably a reproduction of a USGS or other topographic map annotated with location of Facility.
- Site map(s) should illustrate features for planning the WP tasks; these features include the following:

- Petroleum sources including current and former PST system(s).
- Facility buildings.
- Locations of test pits, borings, wells, previous cleanup work and remediation systems.
- Area(s) of proposed cleanup work or installation of remediation systems.
- Adjacent properties and buildings.
- Property boundaries.
- Surface cover.
- Property access points including named/numbered streets and alleyways.
- Groundwater flow direction(s).
- Underground utility mains and service lines.
- Other site-specific map features that may assist with the evaluation of cleanup alternatives.
- Isopleth map(s) of representative contaminant of concern(s).
- Geologic cross-sections (only if this information is relevant to the evaluation of proposed cleanup alternatives).

Section 4: Minimum Work Plan Tasks

This section defines expectations for tasks that will be defined, planned, and budgeted in the WP; however, they are not intended to be performed during the generation of the WP. Rather the work defined in these tasks will occur during the implementation of the DEQ-approved WP.

- Project management for all tasks related to the WP.
- Screen and select site-specific cleanup alternatives to evaluate.
- Discuss cleanup alternatives with DEQ's project manager.
- Conduct pilot, bench or field tests, and treatability studies if required.
- Maintain communication with DEQ's project manager during implementation the WP. The O/O or their consultant is expected to provide sufficient data, information, and to have a discussion with DEQ's project manager upon the completion of critical tasks such as the following:
 - Receipt of any additional analytical data, including pilot, bench, or field test results.
 - Recommend modification(s) to work plan as required to meet RAA objectives.
 - Preparation of Release Closure Plan.
 - Other site-specific milestones.
- Compare the selected cleanup alternatives and evaluate each by considering cost, performance, reliability, implementation, safety and effects on public health, and the environment.
- Prepare or update the Release Closure Plan; discuss with DEQ's project manager.
- Prepare and submit a report detailing the RAA and recommendations.

Section 5: Personnel, Methods, Equipment, and Technology

Identify the personnel to select and evaluate cleanup alternatives and describe the propose methods to conduct testing and obtain field data that may be used to assess cleanup alternatives.

- Experienced geologist(s) or geological engineer(s) (or other experienced professional equivalents) are required to adequately screen and select cleanup technologies, and design pilot tests and treatability studies. Specific education, technical experience, and proven competency is necessary

to develop a matrix evaluation of cleanup alternatives and evaluate them based on the specific criteria required by ARM 17.56.605(3) and to develop the compliance monitoring plan required by ARM 17.56.605(6). Typical environmental technicians do not have this expertise.

- Describe the proposed methods, equipment, and technology used to obtain and analyze data that may be required during the screening and selection of cleanup alternatives; such as the following:
 - Pilot, bench, and field tests – describe the following: proposed test(s); duration of the testing; sampling and analysis plan for all appropriate media; and criteria that will be used to evaluate the effectiveness of the test(s).
 - Sampling and treatability studies – describe the following: study design(s); sampling and analysis plan; and criteria that will be used to evaluate the effectiveness of the studies.
 - Field and analytical methods should be described in similar detail to the requirements detailed in Remedial Investigation – Work Plan Expectations Section 7 of the Remedial Investigation of Petroleum Releases guidance document.
 - Other site-specific methods and procedures specified in WP.

Section 6: Appendices for Work Plan

DEQ may require site-specific attachments to the WP; however, the following appendices for a RAA WP are expected to be included in the report:

- Budget detailing costs for each WP task if the O/O expects to apply for reimbursement from the Petroleum Tank Release Compensation Fund, or upon DEQ's request.
- Quality assurance/quality control (QA/QC) plan for all methods if sampling or testing is proposed.
- Standard operating procedures (SOPs) for all methods if sampling or testing is proposed.
- Disposal of investigation derived waste plan if sampling or testing is proposed.

Stand-Alone Remedial Alternatives Analysis – Report Expectations

Owners and operators (O/O) of properties with petroleum releases (Release) from petroleum storage tank (PST) systems including properties that historically had a PST system (Facility) are required to submit a cleanup plan for petroleum-contaminated soils and groundwater to DEQ. Administrative Rules of Montana (ARM) 17.56.605 requires that preparation of a cleanup plan include a remedial alternatives analysis (RAA) to assess cleanup alternatives and to evaluate whether implementation of the proposed alternative will adequately protect human health, safety, and the environment.

This outline provides O/Os and their consultants with the basic expectations for a RAA report. It is the O/O's responsibility to stay in contact with DEQ's project manager to determine whether modifications to the WP will be necessary to complete RAA objectives. The report expectations discussed in this guidance and detailed below address the issues and expectations for most petroleum releases whether the RAA is a separate project or conducted as part of a remedial investigation (RI).

The items described below are required for a stand-alone RAA report. If a RAA is conducted as part of a RI, only the section for RAA report from this guidance document and appropriate maps should be completed and included in the RI report. Additionally, appropriate conclusions and recommendations developed as part of the RAA should be included in respective Conclusions and Recommendations sections of the RI report.

DEQ will evaluate the RAA against the requirements listed in ARM 17.56.605 and the report expectations listed below. If the RAA report is determined to adequately select and evaluate cleanup and monitoring alternatives, and address all requirements, the report will be accepted. If DEQ determines additional information, data, analysis, or corrections are required to meet RAA objectives then DEQ will notify the O/O and their consultant.

Note: DEQ expects a certain amount of detail in reports submitted during the investigation, cleanup, and monitoring of a Release from a PST system to meet the requirements of Montana and federal law. Some information may be duplicated in successive reports. Information and details that should not change significantly may be excerpted from other reports with little or no modification (e.g., facility location, geology, hydrogeology, etc.). However, all tables, maps, and the Release Closure Plan should be updated when additional data are available for each successive report.

Title Page

- Title of the report should be as follows: Remedial Alternatives Analysis Report for the petroleum release at (facility name, street address, town), Montana (zip code).
- DEQ Facility ID Number, Release (number), and Work Plan (number).
- Responsible parties name, mailing address and phone number.
- Consulting company, address, and phone number (if not on letterhead).
- Contact person's name, mailing address and phone number (if different from above).
- Date report prepared.

Executive Summary

The executive summary should not exceed one page in length. It should provide a succinct summary of the alternatives evaluated and the reasons for selecting the proposed alternative.

Table of Contents

- Include titles of report sections and page numbers (please use naming convention for main sections listed herein).
- Lists of tables and figures.
- List of appendices.

Purpose and Objectives of RAA Report

Describe the site-specific issue(s) that the RAA was expected to address.

Facility History and Release Background

Update and include the Facility History and Release Background section from the Remedial Investigation (RI) Report as part of the RAA report; and include the following:

- History of the facility pertaining to storage and dispensing of petroleum products, including identification of the type(s) of petroleum products used at the facility.
- History of petroleum contamination discovered at the facility including: current and previous releases, type(s) of petroleum, and impacted media.
- History of responses to petroleum contamination including initial actions, cleanup work completed, and other cleanup activities.

Facility Conditions and Results of Remedial Investigation

Summarize the results of the RI including current site status and potential threats to human health and the environment caused by the Release.

- Release source location(s); extent and magnitude of petroleum-impacted media; potential threats to human health and the environment; and other available information beneficial to evaluating cleanup alternatives.
- Access to facility, areas of contamination, and receptors.
- Soil types, stratigraphy, and their expected effects on cleanup alternatives.
- Depth(s) to groundwater and groundwater flow direction(s).
- Location and types of receptors, for example: basements, utilities, and water supplies (community, public water system, private wells).
- Other contaminants including petroleum releases, solvent releases, etc., that may affect selection of cleanup alternatives.
- Describe any data and information gaps that may be required to further evaluate cleanup alternatives, for example: pilot tests, additional investigation of receptors, etc.

Maps to Illustrate Proposed Cleanup Methods at the Facility

All maps should include a north arrow, scale, map legend, and title with the Facility name in the title block. Location and site maps on a true-scale map (annotated aerial photos are not acceptable for these base maps) should be the base for other maps provided in this report and future reports. Expectations for maps are detailed with examples in DEQ's RI Guidance for Petroleum Releases.

- Location map – preferably a reproduction of a USGS topographic map or other equivalent (refer to example Location Map in RI Guidance).

- Area map(s) illustrating the surrounding 2-3 city blocks, other properties, receptors, and relevant features of the site and adjacent areas (refer to example Area Map in RI Guidance). The map(s) should show the following:
 - Adjacent buildings and property use(s).
 - Basements, tile drains, and sump systems on and adjacent to the property.
 - Property boundaries and easements.
 - All above and underground utilities and conduits (including electrical, gas, water, sanitary and storm sewers, telephone, cable) on and adjacent to the property.
 - Surface cover.
 - Street maps or named/numbered streets.
- Site map(s) should illustrate Facility details (refer to example Site Map in RI Guidance) including the following:
 - Facility buildings, structures, utilities.
 - Current and former USTs, ASTs, piping, dispensers, and other sources of petroleum.
 - Location of all current and previous Releases at Facility and on adjacent properties.
 - Extent and magnitude of petroleum impacts.
 - Locations of environmental, construction, and cleanup activities pertinent to the release (excavations, test pits, soil borings, samples, monitoring wells, remediation systems, etc.).
 - Isopleth map(s) of representative contaminants of concern.
 - Geologic cross-sections (only if this information is relevant to the evaluation of proposed cleanup alternatives).
- Site map(s) that illustrate locations of the cleanup work proposed in the RAA.

Remedial Alternatives Analysis (RAA)

Describe the RAA results and recommendations that includes in addition to the text a matrix evaluation that provide a comparison of the proposed cleanup alternative to the other reasonable alternatives based on the criteria specified in ARM 17.56.605(3); this will include a discussion of the following:

- Identify volume and area of contaminated media.
- Describe site conditions that directly affect the selection and evaluation of cleanup alternatives.
- Describe the cleanup alternatives being evaluated:
 - Describe how cleanup alternatives were chosen for further evaluation.
 - Describe each cleanup alternative selected and evaluated.
- Evaluate and compare proposed cleanup alternatives; describe how each cleanup alternative would or would not meet each of the following evaluation criteria:
 1. Cost.
 2. Performance:
 - a- Protection of human health and the environment.
 - b- Cleanup-method specific regulatory requirements.
 - c- Cleanup-method specific feasibility considerations.
 - d- Contamination-specific requirements.

- e- Location-specific requirements.
 - 3. Reliability, both short-term and long-term.
 - 4. Implementation considerations (sampling or treatability studies).
 - 5. Safety.
 - 6. Effects on public health and the environment.
 - 7. Other site-specific issues and considerations.
- Present a matrix evaluation of cleanup alternatives against evaluation criteria using the Release Closure Plan (RCP) Part 3 (Evaluation of Cleanup Alternatives).
 - Describe compliance monitoring necessary to evaluate the effectiveness of each cleanup method and allow for optimization of potential systems:
 - Present a compliance monitoring plan for each cleanup alternative using the RCP Part 4 (Compliance Monitoring).
 - Determine the confirmation sampling required to assess effectiveness of and compliance with cleanup goals following completion of the proposed cleanup alternative.
 - Describe the selection of the cleanup alternative that best meets the evaluation criteria; which should include a description of the compliance monitoring for that cleanup method.
 - Recommend a site-specific cleanup method and compliance monitoring plan.

Release Closure Plan (RCP)

The O/O and their consultant should develop and update plans to cleanup, monitor, and resolve the Release based on the results of the completed RI and the RAA. These plans should be based on site-specific data and documentation including the following: extent and magnitude of petroleum impacts; surface conditions, accessibility and subsurface stratigraphy; professional judgement; and experience in the area. DEQ expects the RCP (format below) will be updated when additional information and data are available; and that an updated RCP will be appended to the RAA report and all future reports for the Release.

- Develop a site-specific RCP based on the results and conclusions of the RI and RAA. Use the RCP Excel spreadsheet format (available at DEQ's website); it has four interdependent parts:
 - Part 1 - Site Summary and RI Results.
 - Part 2 - Conceptual Site Model and Evaluation of Exposure Pathways.
 - Part 3 - Evaluation of Cleanup Alternatives.
 - Part 4 - Compliance Monitoring.
- Propose closure of the Release only if all the data demonstrate that there are no petroleum impacts exceeding risk-based screening levels or regional screening levels for all media or that all exposure pathways are incomplete.
- Propose site-specific appropriate cleanup and monitoring methods required to remediate and resolve the Release:
 - Each proposed site-specific cleanup method will be evaluated on the criteria included in ARM 17.56.605(3) – cost, performance, reliability, implementation, safety and effects on public health and the environment.
 - Evaluation of Cleanup Alternatives (Part 3) of the RCP will describe the cleanup methods.

- Compliance Monitoring (Part 4) of the RCP will describe the monitoring for each cleanup alternative considered.
- Details and evaluation of proposed site-specific cleanup methods and monitoring that cannot be captured in the spreadsheet will be described in the report text; a separate description should be included for each cleanup method.
- Discuss the RCP and proposed cleanup methods with DEQ's project manager while preparing the RAA report and prior to submitting report to DEQ.
- Complete the RCP including a discussion of the plan in the report text and a copy of the RCP in an Appendix of the RAA report.

Conclusions

Briefly state whether the RAA objectives have been met for the Release; technical conclusions should be stated with reasonable professional certainty and under the standard of care applicable. Describe the feasible cleanup alternative(s) and how human health, safety, and the environment will be adequately protected by implementation of the cleanup. Describe critical data gap(s) that may limit implementation of the cleanup method(s).

Recommendations

State recommendations for work required to cleanup, monitor, and close the Release. Technical recommendations should be stated with reasonable professional certainty and under the standard of care applicable and should include the following:

- Make site-specific recommendations that are consistent with details in the RAA report and summarized in the RCP.
- Propose site-specific cleanup and compliance monitoring plans.
- Propose a design, construction, and implementation of the selected cleanup alternative; include proposed schedules, operation, maintenance, and compliance monitoring.
- Propose collection of the additional data required.

Signature page should be signed and dated

Limitations

References

Appendices

DEQ may require site-specific attachments to the report; however, the following appendices for all RAA reports are typically required.

- Maps.
- Updated Release Closure Plan.
- Tables summarizing laboratory analytical data and field data for soil, water, and petroleum vapor samples.
- SOP (unless included in WP).

Release Closure Plan – Part 1: Site Summary & RI Results

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases (7 Mar 2018)			
Part 1: Site Summary & Remedial Investigation (RI) Results reference: MT DEQ Remedial Investigation (RI) Guidance for Petroleum Releases			
	Date:	DEQ PM:	
Facility Name / Address:		Release:	WP ID:
Release Cause, Source(s) & Petroleum Types: other releases onsite and nearby:			
Site Use(s) -- Former, Current & Planned: Surface Conditions & Access: former Petroleum Tank Systems: current Petroleum Tank Systems: Other:			
Site Information			
Stratigraphic sequence - layers & thicknesses: Stratigraphic Continuity - Lateral Variation(s): Groundwater Depth & Flow Direction(s): Aquifer(s) unconfined, confined, perched Receptor Depth/Location (basements, utilities): Other:			
Subsurface			
Petroleum Types, Age & NAPL Mobility: Surface Soil Impacts (0 to 2 ft bgs): Vadose-Zone Soil Impacts: Smear-Zone Soil Impacts: Groundwater Impacts: Surface Water Impacts: Petroleum Vapor Impacts: Other:			
Extent & Magnitude			
RI and Monitoring Reports & Dates: Pilot Tests & Results: Results from Cleanup(s): Other:			
Reports			
What currently prevents Release Closure? additional information required for PMZ Closure: Information & Data Gaps: Recommendations and comments:			

Release Closure Plan – Part 2: CSM - Evaluation of Exposure Pathways

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan						(7 Mar 2018)
for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases						
Part 2: Conceptual Site Model (CSM) - Evaluation of Exposure Pathways						
reference: MT DEQ Risked-Based Corrective Action (RBCA) Guidance for Petroleum Releases						
Consultant: 0		Date: 1/01/2000		DEQ PM: 0		
Facility Name: 0				Complete Description for All Receptors Describe why a Receptor is not threatened or impacted; and Describe proposed Investigation, Cleanup, and/or Monitoring Methods for each threatened or impacted Receptor.		
Facility ID: 0		Release: 0	WP ID: 0			
Petroleum Source(s)	Affected Medium	Exposure Medium / Point	Exposure Route			Receptor
→	Surface Soil (0 - 2 ft bgs)	→ Soil	→ Ingestion → Dermal	→ Resident and/or Worker		
		→ Soil	→ Leaching	→ Groundwater		
		→ Dust/Vapors	→ Inhalation	→ Resident and/or Worker		
		→ Surface Erosion to Surface Water and Sediment	→ Ingestion → Dermal	→ Recreator, Ecological Receptor ¹		
→	Sub-Surface Soil (> 2 ft bgs)	→ Soil	→ Ingestion → Dermal	→ Construction Worker ²		
		→ Soil	→ Leaching	→ Groundwater		
		→ Indoor Air	→ Inhalation	→ Commercial or Residential Indoor Air		
		→ Dust/Vapors	→ Inhalation	→ Construction Worker		
		→ Buried Water Line	→ Ingestion → Dermal	→ Resident and/or Worker		
		→ Buried Utility Line	→ Inhalation of Indoor Air	→ Indoor Resident and/or Worker		
→	Groundwater	→ Groundwater	→ → →	→ State water ³		
		→ Indoor Air ⁴	→ Inhalation of Indoor Air	→ Resident and/or Worker		
		→ Groundwater and Vapors	→ Ingestion → Dermal → Inhalation	→ Construction Worker ²		
		→ Drinking Water	→ Ingestion → Dermal	→ Resident and/or Worker		
		→ Surface Water and/or Sediment	→ Ingestion → Dermal → Inhalation	→ Recreator, Ecological Receptor		
		→ Buried Water Line	→ Ingestion → Dermal	→ Resident and/or Worker		
		→ Buried Utility Line	→ Inhalation of Indoor Air	→ Indoor Resident and/or Worker		
		→ Buried Utility Line	→ Inhalation of Indoor Air	→ Indoor Resident and/or Worker		
Data Gaps:						
Recommendations:						
Footnotes:						
1. Ecological Receptors (e.g. plants and animals) can be added as a separate line associated with surface soil but it is not common for PTC sites.						
2. Construction worker covers excavations conducted for building construction, utility installation and repair, as well as residents planting trees, etc.						
3. Standard or RBSL exceedence are a complete pathway to a receptor, which is state water (or groundwater).						
4. Indoor Air is the exposure medium for a potential or known vapor intrusion setting where a resident or an employee of a business may breathe petroleum vapor from the release.						

Release Closure Plan – Part 3: Evaluation of Cleanup Alternatives

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan							(7 Mar 2018)
for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases							
Part 3: Evaluation of Cleanup Alternatives							reference: MT DEQ Remedial Alternatives Analysis (RAA) Guidance for Petroleum Releases
Consultant: 0		Date: 1/01/2000		DEQ PM: 0			
Facility Name / Address: 0			Release: 0		WP ID: 0		
Facility ID: 0			Enter appropriate site-specific Cleanup Methods that are based on RI results & CSM				
<p>A. Administrative Rules of Montana 17.56.605(3) requires screening and selection of cleanup methods to develop a matrix evaluation of cleanup alternatives. A cleanup plan requires information on all alternatives and an explanation why any alternative was selected.</p>							
<p>Evaluation Criteria</p>							
Estimated Costs							
Protective of Human Health & Environment (e.g. residences, utilities, water supply, future use)							
Method-specific regulatory requirements (e.g. disposal of impacted soil & water, access agreements)							
Method-specific feasibility requirements (e.g. pilot tests, treatability studies)							
Contaminant-specific requirements (e.g. method achieves soil & GW RBSLs & DEQ-7 standards)							
Location-specific requirements (e.g. potential historical, cultural, or ecological significance, or site near wetlands, floodplains, surface water, endangered species / migratory bird habitat)							
Reliability -- Short Term							
Reliability -- Long Term							
Implementation Issues & Limitations							
Safety Issues							
Effects on Public Health and Environment (includes Receptors)							
Other site-specific criteria & issues:							
Advantages of Cleanup Method:							
Disadvantages of Cleanup Method:							
Est. Years to Complete Cleanup Method:							
Cleanup Recommendations:							
Information & Data Gaps:							
Recommendations and comments:							
<p>* Note: Cleanup technologies may be removed or added as appropriate for each Release; however, the 'No Action' alternative must be evaluated for comparison at every Release.</p>							

Release Closure Plan – Part 4: Compliance Monitoring

MT DEQ Petroleum Tank Cleanup Section -- Release Closure Plan						(7 Mar 2018)
for the Investigation, Cleanup, Monitoring & Closure of Petroleum Releases						
Part 4: Compliance Monitoring						
reference: MT DEQ Remedial Alternatives Analysis (RAA) Guidance for Petroleum Releases						
Consultant: 0		Date: 1/01/1900		DEQ PMT 0		
Facility Name / Address: 0			Release: 0			
Facility ID: 0			WP ID: 0			
Compliance & Operation Monitoring Methods to Evaluate Effectiveness of each Cleanup Alternative Listed in Part 3						
Administrative Rules of Montana 17.56.005(6) requires the cleanup plan to include a plan and schedule for compliance monitoring to evaluate the effectiveness of cleanup activities.						
Evaluation of Cleanup						
Confirmation Sampling	No Action*	e.g. Excavation	e.g. Excavation & ORC	e.g. SVE & AS	fill-in as needed or leave blank	fill-in as needed or leave blank
Borings/Monitoring Wells (MWs)						
GW Monitoring (freq., wells, years)						
System O/M (frequency & years)						
Petroleum Vapor Monitoring (freq. locations, years)						
Receptor Monitoring						
Waste Management						
Other site-specific monitoring:						
Method(s) to Evaluate Interim Results and Optimize Cleanup:						
Est. Years to Complete all Monitoring:						
Estimated costs for O/M & monitoring:						
Estimated Total Years to Closure:						
Natural Attenuation Trends:						
What currently prevents Closure?						
Is this a PMZ Closure Candidate?						
Other:						
Closure						
Information & Data Gaps:						
Recommendations and comments:						
* Note: Cleanup technologies may be removed or added as appropriate for each Release; however, the 'No Action' alternative must be evaluated for comparison at every Release.						