Remedial Investigation

Contents

(Updated August 2013)

Remedial Investigation

Introduction

The purpose of a remedial investigation (RI) is to gather adequate information regarding petroleum releases to make reliable cleanup and closure decisions. RIs are typically completed immediately following the discovery of high-priority releases, but may be delayed at releases classified as lower priority by the Department of Environmental Quality (DEQ).

The requirement for owners and operators (O/O) of petroleum storage tanks to conduct RIs and a general description of an RI is outlined in Administrative Rules of Montana (ARM) 17.56.604, which states:

> In order to determine the full extent and location of soils contaminated by the release and the presence and concentrations of free and dissolved product contamination in the surface water and in groundwater, owners and operators must conduct a remedial investigation of the release, the release site, and the surrounding area possibly affected by the release…

A remedial investigation generally is an expanded site assessment, more detailed in scope than the initial response and abatement measures under ARM 17.56.602, which must define the nature, extent, and magnitude of contamination and identify threats to public health, welfare and the environment.

Remedial Investigation Goals

A complete RI must determine, with a reasonable amount of scientific certainty, all of the following:

- The background of the release, including all known and suspected sources of the release, known and potential impacts of the release, and any actions taken to address the release.
- The site history, including all relevant information concerning the current and historical activities and physical and legal aspects of the site that may affect the release, its impacts to human health and the environment, or its investigation and cleanup.
- The extent, location, and concentration of contamination in soil, surface water, and groundwater.
- The extent of soil contamination must be determined through sampling and laboratory analysis to the limits bounded by concentrations less than reporting limits listed in ARM 17-56-(New Rule I)(1)(b). These reporting limits include risk-based screening levels (RBSLs) published in the Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases (RBCA), dated September 2009, and Preliminary Remediation Goals published by U.S. EPA Region 9 for contaminants not listed in RBCA. The lateral and vertical extent must be measured for both surface and subsurface contamination.
- The extent of surface water and groundwater contamination must be determined to limits bounded by no detectable concentrations of the contaminant at the best achievable practical concentration limits typically achieved by laboratories for the greatest seasonal extent of the contamination plume.
- The extent of contamination in any other media such as soil gas, vapors collecting inside structures, and utility lines (including backfilled bedding material) must also be measured when applicable.
- DEQ will consider exemptions to this requirement to fully identify the extent and magnitude of the release on a case-by-case basis, based on inaccessibility or impracticability of gathering the data.

- Identification of current and potential future receptors that may be impacted by the release. All potential receptors must be listed whether an impact has been proven or discounted. A discussion of the data supporting how a receptor is or is not impacted may be included.
- Investigation of all probable routes of exposure from the release to identified receptors. In addition to the typical routes such as direct contact or drinking of groundwater, the RI must also investigate routes such as vapor intrusion into buildings, permeation of water supply lines, or any other potential pathways.

Standardized CAP and Report Formats are Applicable to Most Release Investigations

The standardized CAP and report formats discussed in this guidance should address the majority of release sites. However, DEQ understands that they may not address the needs of every release. O/Os should conform to the standardized formats in this guidance whenever possible to facilitate review of documents and to ensure adequate information is collected to make proper decisions to safeguard human health and the environment. When a DEQ project manager (PM) determines non-standard site-specific CAPs and/or reports are necessary, the PM will outline precisely what will be required using as much of the standardized CAP and report formats as possible. Only a DEQ PM can approve modification to the CAP and report formats in this guidance or the use of site-specific CAPs and reports. Approval to use CAP and report formats must be granted by DEQ before the work is completed, not after the fact. O/Os are encouraged to contact the PM to confer on draft work products as they are being prepared or to clarify any portion of a work request they do not fully understand.

RIs may be Completed in Phases

Because the full extent and magnitude of a release is unknown until an RI is completed, it is not uncommon for the first phase of an RI to identify only a portion of the full release. Therefore, O/Os may need to conduct several phases of investigatory work to fully define a release, each subsequent phase of work building on information discovered during previous phases.

Request for an Initial RI CAP

When a DEQ PM requests a RI, the O/O should prepare a CAP in accordance with the standardized CAP for Remedial Investigations (CAP RI-01). Sections 4.3 and 6.8 through 6.15 should only be included in the CAP if they are specifically requested by the PM. The PM may also provide site-specific guidance to the O/O for additional items to be included or excluded in the RI. The O/O is encouraged to contact the DEQ PM about any issues they may not understand in the completion of the CAP.

The CAP will be reviewed and approved by the PM if it meets the requirements of a Standardized CAP RI-01 and site-specific guidance provided by the PM. The O/O will be notified of DEQ's approval and given a timeframe to have the work outlined in the CAP completed and a report submitted. If a release is potentially eligible for reimbursement, Petroleum Tank Release Compensation Board staff will also be notified.

RI Report

Once fieldwork has been completed and data gathered, the O/O must document the results of the investigation in accordance with the standardized report for a Remedial Investigation at a Petroleum Release Site (Report RI-01) and any additional guidance provided by the PM in the CAP approval letter. If the O/O identifies unexpected conditions that may pose an immediate risk to receptors at any time during the investigation, the O/O should immediately notify the PM and take steps to mitigate the risks.

Request for Additional RI

If additional information is needed to characterize a release beyond the initial RI, the PM will request that the O/O prepare a CAP to address additional investigative work. The requested CAP may be in the form of a thorough Additional Remedial Investigation CAP (CAP RI-02), an abbreviated CAP (AC-00 through AC-07), or a site-specific CAP specified by the PM. The PM will clearly identify which CAP format is required when requesting that the O/O complete additional work. [Section 7 of this guidance discusses Abbreviated CAPs and Reports.]

Additional RI Reports

Reports documenting investigatory work beyond an Initial RI may take many forms depending on the tasks completed and the requirements of the PM. Most often, a PM will require that the O/O complete and submit a report that includes only the relevant sections of the RI Report format (Report RI-01) that address the specific tasks completed. In a few cases the PM will request an updated, stand-alone RI Report (Report RI-01) with the additional information included. The PM may also request an abbreviated report format (AR-00 through AR-07). The PM will clearly identify which report is required when requesting that the O/O complete additional work. [Section 7 of this guidance discusses Abbreviated CAPs and Reports.]

Standardized Corrective Action Plan for an Initial Remedial Investigation (CAP RI-01)
Montana Department of Environmental Quality Petroleum Technical Section (PTS)

The following lists minimal requirements for an Initial Remedial Investigation Corrective Action Plan. Please omit any section describing tasks that were not requested by the department and note the omission in the RI report.

Cover Letter
(This letter should be no longer than one page.)
Date
Responsible party's name and mailing address
Contact person's name and mailing address (if different from above)
Subject Line with the following information:
- Title (Corrective Action Plan and Budget for Remedial Investigation) for the petroleum release at (Facility name, street address, town), MT (zip code); DEQ Facility ID (number) and Release (number)

Introductory paragraph containing reference to DEQ's request for corrective action plan and general scope of work to be conducted
Consultant's name, address and phone number (if not on letterhead)
Name of person who prepared the workplan

Background Narrative
(This portion of the workplan should be used as section 4.0 of the RI report.)
When, how, and by whom contamination was discovered
Type of products stored at site
Type of contamination
When and who reported the release to DEQ
Summary of initial actions undertaken and by whom
Summary of regulatory history
Current site status: What work has already been done and what do we already know about the release and its potential threats to human health and the environment?

Summary of Site Conditions
What is the local soil type and how will that affect contaminant fate and transport?
Is a community water supply in place or do residents use individual wells?
What is the depth to first groundwater?
What are the contaminants of concern and potential concern?

Maps
Location map – preferably a reproduction of a USGS topographic map; to be used as section 6.3 of report
Facility sketch/map – a true scale digitized base map that can be used later as a base for all other maps provided in the report is preferred. If a true scale map has not yet been prepared, then a "best estimate" site sketch may be acceptable for simple sites. The facility sketch should show the following:
- All known and suspected sources of petroleum (tanks, pipes, dispensers, waste pits, French drains, etc.) – current and historical
- Facility buildings
- Property lines and easements

Known and estimated utilities (buried and overhead)
Surface cover
Adjacent buildings and property use
Locations of environmental and construction activities pertinent to the release (excavations, test pits, soil borings, samples, etc.)
Water wells
Local topographic slope
Expected or known flow direction of groundwater
Location of surface water bodies
North arrow and scale
Aerial photograph (if required/approved by DEQ)

Purpose and Objectives of Investigation

(This portion of the workplan should be used as section 5.0 when preparing the RI report.)
Specific goals of this investigation
Identify and state the purpose and objectives of each task

Proposed Work

Some types of work will always be included in an Initial Remedial Investigation; other work may only be necessary on a site-specific basis. The DEQ project manager (PM) will use professional judgment to determine what types of additional investigations or information gathering are necessary to adequately document site conditions and evaluate risk. Sections 6.1 through 6.7 and section 6.16 are required for all Initial Remedial Investigations. Sections 6.8 through 6.15 should be included only if requested by the PM.

Initial site reconnaissance – this may be verbally approved by the PM prior to workplan approval
Preparation of workplan – this may be verbally approved by the PM prior to workplan approval
Project management
Client consultation
DEQ consultation
Preparing scopes of work and soliciting bids from subcontractors
Telephone calls
Tracking budget
Map preparation
Site mapping
Drafting
Travel
Receptor Survey
- Identification of all potential receptors in the area
- Identification of migration pathways and discussion of potential completion
- Preparation of maps and/or aerial photographs (if requested)
- Extent and magnitude of contamination
- Data compilation and analysis
- Preparation of map, cross-section, and/or aerial photographs (if requested)

Site History (if requested)
- Ownership research – at least back to the time at which the release from the tank could have occurred
- Site operational research – at least back to the time at which the release from the tank could have occurred

- Research of all releases that have occurred on the facility
- Preparation of maps and/or aerial photographs (if requested)

Soil Investigation (if requested)
- Description of methodology (test pits, borings, direct push, etc.)
- Sampling methodology (collection, field screening and analysis)
- Sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Groundwater Investigation (if requested)
- Description of methodology (existing supply wells, monitoring wells, direct push, etc.)
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Soil Vapor Investigation (if requested)
- Description of methodology
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis (must include field instrument calibration)
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Structure Vapor Intrusion Investigation (if requested)
- Description of methodology
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map and diagrams of buildings
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis (must include field instrument calibration)
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Utility Investigation (if requested)
- Utility research – Note: a limited amount of research can be pre-approved in order to prepare this workplan
- Description of methodology (test pits, borings, internal inspection, etc.)
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Other Data Results (if requested)

Migration pathways and exposure potential evaluation (if requested)
- Description of methodology
- Data compilation and synthesis

Report Preparation
- Data consolidation and tabulation
- Data evaluation

Report Writing

Schedule

Include dates when phases of work will begin, when they will be completed, and when information and reports will be provided to DEQ. If specific dates cannot be determined until after the CAP is approved, then provide generic timeframes.

Budget

Appendices

Quality assurance/quality control (QA/QC) plan for all methods and sampling proposed (may be on file with DEQ)

Standard operating procedures (SOPs) for all methods and sampling proposed (may be on file with DEQ)

Disposal of investigation derived waste plan

Standardized Corrective Action Plan for an Additional Remedial Investigation (CAP RI-02)
Montana Department of Environmental Quality Petroleum Technical Section (PTS)

The following lists minimal requirements for an Initial Remedial Investigation Corrective Action Plan. Please omit any section describing tasks that were not requested by the department and note the omission in the RI report.

Cover Letter
(This letter should be no longer than one page.)
Date
Responsible party's name and mailing address
Contact person's name and mailing address (if different from above)
Subject Line with the following information:
- Title (Corrective Action Plan and Budget for Remedial Investigation) for the petroleum release at (Facility name, street address, town), MT (zip code); DEQ Facility ID (number) and Release (number)

Introductory paragraph containing reference to DEQ's request for corrective action plan and general scope of work to be conducted
Consultant's name, address and phone number (if not on letterhead)
Name of person who prepared the workplan

Background Narrative
(This portion of the workplan should be used as section 4.0 of the RI report.)
When, how, and by whom contamination was discovered
Type of products stored at site
Type of contamination
When and who reported the release to DEQ
Summary of initial actions undertaken and by whom
Summary of regulatory history
Current site status: What work has already been done and what do we already know about the release and its potential threats to human health and the environment?

Summary of Site Conditions
What is the local soil type and how will that affect contaminant fate and transport?
Is a community water supply in place or do residents use individual wells?
What is the depth to first groundwater?
What are the contaminants of concern and potential concern?

Maps
Location map – preferably a reproduction of a USGS topographic map; to be used as section 6.3 of report
Facility sketch/map – a true scale digitized base map that can be used later as a base for all other maps provided in the report is preferred. If a true scale map has not yet been prepared, then a "best estimate" site sketch may be acceptable for simple sites. The facility sketch should show the following:
- All known and suspected sources of petroleum (tanks, pipes, dispensers, waste pits, French drains, etc.) – current and historical

Facility buildings
Property lines and easements
Known and estimated utilities (buried and overhead)
Surface cover
Adjacent buildings and property use
Locations of environmental and construction activities pertinent to the release (excavations, test pits, soil borings, samples, etc.)
Water wells
Local topographic slope
Expected or known flow direction of groundwater
Location of surface water bodies
North arrow and scale
Aerial photograph (if required/approved by DEQ)

Purpose and Objectives of Investigation

(This portion of the workplan should be used as section 5.0 when preparing the RI report.)
Specific goals of this investigation
Identify and state the purpose and objectives of each task

Proposed Work

Some types of work will always be included in an Initial Remedial Investigation; other work may only be necessary on a site-specific basis. The DEQ project manager (PM) will use professional judgment to determine what types of additional investigations or information gathering are necessary to adequately document site conditions and evaluate risk. Sections 6.1 through 6.7 and section 6.16 are required for all Initial Remedial Investigations. Sections 6.8 through 6.15 should be included only if requested by the PM.

Initial site reconnaissance – this may be verbally approved by the PM prior to workplan approval
Preparation of workplan – this may be verbally approved by the PM prior to workplan approval
Project management
Client consultation
DEQ consultation
Preparing scopes of work and soliciting bids from subcontractors
Telephone calls
Tracking budget
Map preparation
Site mapping
Drafting
Travel
Receptor Survey
Identification of all potential receptors in the area
Identification of migration pathways and discussion of potential completion
Preparation of maps and/or aerial photographs (if requested)
Extent and magnitude of contamination
Data compilation and analysis
Preparation of map, cross-section, and/or aerial photographs (if requested)

Site History (if requested)
- Ownership research – at least back to the time at which the release from the tank could have occurred
- Site operational research – at least back to the time at which the release from the tank could have occurred
- Research of all releases that have occurred on the facility
- Preparation of maps and/or aerial photographs (if requested)

Soil Investigation (if requested)
- Description of methodology (test pits, borings, direct push, etc.)
- Sampling methodology (collection, field screening and analysis)
- Sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Groundwater Investigation (if requested)
- Description of methodology (existing supply wells, monitoring wells, direct push, etc.)
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Soil Vapor Investigation (if requested)
- Description of methodology
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis (must include field instrument calibration)
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Structure Vapor Intrusion Investigation (if requested)
- Description of methodology
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map and diagrams of buildings
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis (must include field instrument calibration)
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Utility Investigation (if requested)
- Utility research – Note: a limited amount of research can be pre-approved in order to prepare this workplan
- Description of methodology (test pits, borings, internal inspection, etc.)
- Sampling methodology (collection, field screening and analysis)
- Proposed sample location map
- QA/QC plan (may be on-file with DEQ or included in an appendix)
- Data compilation and synthesis
- Preparation of maps, cross-sections, and/or aerial photographs (if requested)

Other Data Results (if requested)

Migration pathways and exposure potential evaluation (if requested)
- Description of methodology
- Data compilation and synthesis

Report Preparation
- Data consolidation and tabulation
- Data evaluation

Report Writing

Schedule

Include dates when phases of work will begin, when they will be completed, and when information and reports will be provided to DEQ. If specific dates cannot be determined until after the CAP is approved, then provide generic timeframes.

Budget

Appendices

Quality assurance/quality control (QA/QC) plan for all methods and sampling proposed (may be on file with DEQ)

Standard operating procedures (SOPs) for all methods and sampling proposed (may be on file with DEQ)

Disposal of investigation derived waste plan

Standardized Report for an Initial Remedial Investigation (Report_RIR-01)
Montana Department of Environmental Quality Petroleum Technical Section (PTS)

A Remedial Investigation is required to determine the extent and magnitude of contamination associated with a petroleum release and to evaluate the risk it poses to human health and the environment. The PTS project manager will use professional judgment to determine what types of additional investigations or information gathering are necessary to adequately document site conditions and evaluate risk.

The report format listed herein includes most of the typical technologies that may be required as part of a remedial investigation and the minimal requirements for a Remedial Investigation Report. Not all of these sections may be required for individual release sites. When sections of this report format are not included in the scope of work conducted under the approved RI CAP for the release, omit those sections and provide an explanation for the omission in the RI Report.

This outline provides owners/operators and consultants with the basic information that a Remedial Investigation Report for a petroleum release site must contain before it will be reviewed by PTS.

Following the collection and analysis of field data, it may become apparent that additional investigation will be required to determine the full extent and magnitude of contamination and to evaluate the risk it poses to human health and the environment. Additional investigations may be required to gather this additional information and to complete the remedial investigation. When this occurs, additional information should be included in an Additional Investigation Report.

Title Page
Title of report: Initial Remedial Investigation for…
Facility name
Facility address
DEQ Facility ID Number and Release Number
Responsible party's name, mailing address and phone number
Consultant's name, address and phone number.
Contact person's name, mailing address and phone number (if different from above)
Date report prepared
Title and date of approved RI CAP

Executive Summary
Executive summary of the report highlighting the significant methods of investigation, and the findings, conclusions, and recommendations of the investigation

Table of Contents
Include titles of report sections and page numbers (please use the naming/numbering style of the main sections listed herein)
List of tables and figures
List of appendices

Background

When, how, and by whom contamination was discovered
Type of products stored at site
Type of contamination
When and who reported the release to DEQ
Summary of initial actions undertaken and by whom
Summary of regulatory history
Current site status. What work has already been done and what do we already know about the release and its potential threats to human health and the environment?

Purpose and Objectives of Investigation

Specific goals of this investigation
Identify general tasks, state the purpose and objectives of each task

Site History (if completed)

History of the ownership and operation of the facility, since at least the time at which the release from the tank could have occurred, including the following:

- The name, current address and telephone number of all current owners and operators
- The name, current address and telephone number (if known) of all past owners and operators
- The years of current and past ownership and/or operation
- A description of the activities conducted at the site by each current and past owner/operator
- A general construction history of the site
- Former and existing hazardous material/waste storage areas, lagoons and waste pits
- Waste management history

History of operation of ASTs and USTs since at least the time the release from the tank did or could have occurred at the site, including the following (some or all of this information may be presented in tabular form):

- Dates of installation and removal of all existing and former tanks located on the site
- Volume of tank(s)
- Tank and piping construction material
- Tank configuration, piping layout, check valves
- Overfill/spill protection
- Cathodic protection
- Dates and descriptions of repairs, replacements, or modifications to tanks and ancillary piping
- Condition of tanks/piping if removed, location and size of perforations
- Method and results of product inventory reconciliation (describe and attach copies of product inventory charts)

A description of all known and suspected leaks, spills, overfills or other releases from USTs, ASTs, and any other petroleum sources located on the site. The following information should be included for each occurrence:

- Date of release
- Date release was reported to DEQ
- Type of product(s) released
- Quantity released

Quantity recovered
Known or suspected cause of the release
Location of the release on the site
Cleanup action taken
Offsite effects

Maps and Site Technical Information

Facility site map or maps with descriptions or symbols appropriate in scale and scope showing the following within a 500-foot (unless otherwise noted) radius of the site (information may be shown on more than one map for clarity):

Existing and former USTs, ASTs, piping, dispensers, and other sources of petroleum
Soil boring, test pit or other sample locations (if completed)
Locations of any other environmental samples collected
Monitoring wells (if completed)
Recovery wells (if completed)
Other remediation equipment (if installed)
Underground utilities on and adjacent to the property (sewer, water, telephone, electric)
Above ground utilities (overhead wires)
Basements and tile drain and sump systems on the facility and adjacent to the property
Existing and former hazardous material/waste storage areas
Adjacent buildings (structures)
Domestic, municipal and irrigation wells
North arrow and scale
Local map (2-3 city block area) showing utilities, residences, wells, business or building usage (children's nursery or machine shop?), potential third parties depending on the contamination type, property lines, magnitude and extent of soil and groundwater contamination

Topographic map of site and surrounding area

Surface water technical information and map(s), including:

Location and use of all surface water within 1 mile of the site
Groundwater/surface water discharge points
Sampling description
Results of laboratory analyses
Site map showing the aerial extent of free product based on subsurface investigatory methods (e.g., monitoring wells, soil borings, or direct push technology)
Location, ownership, use, and construction of all municipal, domestic, irrigation, industrial and monitoring wells within ½ mile of the site

Receptor Survey

Identification of all potential receptors in the area of contamination and possible migration, including:

Drinking water
Groundwater wells
Permeable water mains
Permeable water service connections
Vapors in structures
Residences/public buildings

Utility vaults
Commercial buildings
Direct dermal contact with surface soil (< 2ft bgs)
Residential property
Commercial property
Recreational property
Buried utilities
Open utilities (water, sewer, etc.)
Close utilities (phone, power, etc.)
Surface water
Lakes, rivers, ponds
Wetlands
Storm sewers
Groundwater (not used for drinking, but protected as 'state water')

Migration Pathway Identification

Identify all pathways that may be completed from the contamination source to all potential receptors identified. Include one sub-section for each identified receptor.

Exposure Potential Discussion

Evaluate potential for pathways identified as complete in Sub-Section 8.2, and include one sub-section for each pathway identified.

<u>Extent and Magnitude of Contamination</u>

Describe evidence of releases of petroleum to the environment, including visual and olfactory evidence, results of field screening, laboratory analyses and historical knowledge

Types, concentrations and volumes (if applicable) of all released petroleum and other hazardous material detected to date at the facility

Analytical results for each media sampled must be summarized in the text and in tables in the body of the report

Information and details on the approximate horizontal and vertical extent of soil contamination, on-site and off-site, based on the best available information

Information and details on the approximate horizontal and vertical extent of free-phase petroleum, on-site and off-site, based on the best available information

Information and details on the approximate horizontal and vertical extent of petroleum vapors, on-site and off-site, based on the best available information

Describe and discuss the extent and magnitude of all contamination associated with this release or commingled from other sources that will have an impact, potential risks to human health and the environment, fate and transport, and implications for corrective action

Discuss where the contamination is, how much there is (mass and volume in each location), how it came to be located there, and where it may migrate in the future

Discuss how these data will impact an analysis of cleanup alternatives

Soil Investigation (if completed)

Description of soil investigation

Description of methods (backhoe pits, borings and monitoring well installation, vapor sampling, heated headspace sampling, or other field screening methods). A separate description should be written for each method used.

QA/QC plan (may be on file at DEQ)

Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) submitted to DEQ and on file

Description of soil from test pits, boring completion, or other sample retrieval methods

Field screening results (visual, odors, and vapor survey results) in tabular form with date and time of measurement, depth, location, penetration measurement if taken; time-series graphs and tables if there is more than one sampling period

Isopleths of concentrations shown on a map; possibly a cross-section of sampling results, if samples are taken from more than one depth

Groundwater sampling results (if encountered and sampled from excavation/borings; this information may be included in a groundwater investigation section)

Depth to water and water table elevation measurements (if encountered in excavation/borings; this information may be included in a groundwater investigation section)

Soil type, thickness, and classification below the site of the release

Unconsolidated material and bedrock type, thickness, and formation name below the site of the release

Soil characteristics (grain size, sorting, origin, texture, permeability, classification)

Boring logs and monitoring well logs (may be presented in an appendix), including contaminant screening levels, sediment olfactory observations and vapor readings, and blow count)

Geologic cross-section from boring/excavation information (if applicable)

Soil sample analytical results (presented in tabular form)

Vertical extent of contamination. Include an updated soil contamination extent and magnitude map, if applicable.

Discussion of sampling or analytical anomalies

Groundwater Investigation (if completed)

Description of groundwater investigation

Description of methods (backhoe pits, borings and monitoring well installation, vapor sampling, heated headspace sampling, or other field screening methods). A separate description should be written for each method used.

QA/QC plan (may be on file at DEQ)

Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ

General description and characteristics of aquifers and the unsaturated zone below the site of the release, including:

- Hydraulic characteristics
- Depth to water table (multiple measurements should be presented in a tabular format)
- Surveyed water elevations and contours (potentiometric surface)
- Water table piezometric surface contour map
- Direction of groundwater flow
- Rate of groundwater flow
- Perched or confined aquifer conditions

Connections to other aquifers
Hydrologic cross sections

Description of monitoring well or sampling point completion (description of well, well construction methods, well construction or completion diagram) (may be presented in an appendix)

Field screening results in table form with date and time of measurement, depth, location, penetration measurement if taken; time-series graphs and tables if more than one sampling period

Results of laboratory analyses (multiple measurements should be presented in a tabular format)

Isopleth (iso-concentration) map depicting at least one analyte for each contaminant type (gasoline, diesel, etc.) that best depicts the extent and magnitude of that contaminant. Consult the PTS project manager for selection of analytes depicted.

Discussion of sampling or analytical anomalies

<u>Soil Vapor Investigation (if completed)</u>

Description of vapor investigation

Description of methods used to evaluate potential migration of petroleum vapors into utilities or structures. A separate description should be described for each method used.

QA/QC plan (may be on file at DEQ)

Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ

Vapor measuring instrument calibration data

Type of instrument(s) used for vapor measurements

Weather conditions during collection of vapor readings

Detailed site map of vapor sampling locations

Description of surface and subsurface structures that may influence the migration of vapors through the soil

Description of soil vapor sampling points and soil conditions recorded during driving of sampling points (if taken)

Field observations made during sampling

Field screening, qualitative or quantitative results in table form with date and time of measurement, depth, location, and penetration measurement if taken

Groundwater sampling results (if encountered and sampled from vapor sampling points; this information may be included in the groundwater investigation section)

Depth to water and water table elevation measurements (if encountered in sampling points)

Geologic cross-section from borings/excavations showing vapor concentrations (if applicable)

Isopleths of concentrations shown on a map; a cross-section of sampling results if samples are taken from more than one depth

Map(s) showing the extent of free product, dissolved groundwater phase, and vapors discovered in basements and other subsurface structures and utilities

Map(s) showing all structures and subsurface utilities present near the site that are, or may become, impacted by petroleum vapors associated with the release

Evaluation of the potential for petroleum vapors to migrate into structures and subsurface utilities, including calculations on vapor migration potential under existing site conditions

Discussion of sampling or analytical anomalies

Structure Vapor Intrusion Investigation (if completed)

Description of vapor investigation

Description of methods used to evaluate potential migration of petroleum vapors into utilities or structures. A separate description should be written for each method used.

QA/QC plan (may be on file at DEQ)

Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ

Vapor measuring instrument calibration data

Type of instrument(s) used for vapor measurements

Weather conditions during collection of vapor readings

Vapor sample locations shown on a map

Detailed site map of vapor sampling locations with respect to petroleum contamination (soil, free product, groundwater, and soil vapors) to the extent known

Description of surface and subsurface structures that may influence the migration of vapors through the soil

Description of vapor sampling points and other conditions within structures that may influence sampling results

Field observations made during sampling

Inventory of petroleum products stored in or near each structure sampled

Field screening, qualitative or quantitative results in table form with date and time of measurement

Field screening results in table form with date and time of measurement, depth, location, and penetration measurement if taken; time-series graphs and tables if there is more than one sampling period

Measurements/samples collected to measure for the presence of vapors within utilities or structures

Evaluation of the potential for petroleum vapors to migrate into structures and subsurface utilities. Including calculations on vapor migration potential under existing site conditions.

Discussion of sampling or analytical anomalies

Utility/Utility Corridor Investigation (if completed)

Description of utility investigation

Description of methods used to evaluate potential for petroleum (free phase, dissolved phase, and vapors) to impact buried utilities (backhoe pits, borings and monitoring well installation, vapor sampling, heated headspace sampling, and other field screening methods). A separate description should be written for each method used.

QA/QC plan (may be on file at DEQ)

Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ

Detailed site map of buried utilities and service connections showing soil contamination and investigation points

Description of utility construction materials including gaskets, bedding materials, and any other information pertinent to contaminant permeation or migration

Description of test pits, boring completion, or other utility excavation/inspection

Field observations of utility construction, contamination present, and condition of utilities; include any other observations pertinent to contaminant permeation or migration

Field screening results in table form with date and time of measurement, depth, location, and penetration measurement if taken
Soil sample results
Groundwater sampling results (if encountered and sampled from excavation/borings)
Depth to water and water table elevation measurements (if encountered in excavation/borings)
Geologic cross-section from borings/excavations showing utility corridors in relation to contamination (if applicable)
Observations, field screening data, and sample results from material inside utilities (vapors, water, gas, etc.) if sampled
Discussion of sampling or analytical anomalies

Other Data Results (if completed)

Initial landfarming information (see DEQ landfarming application form) including location map, property ownership, identity of party responsible for tilling and testing, slope of land, soil type, clay content, depth to groundwater, surface water locations, potential environmentally sensitive receptors, nearby residences, present land use and surrounding land use, contaminated (estimated or actual) soil quantity, contaminant concentrations, tilling equipment to be used, tilling intervals, sampling tests and intervals, permits required, stockpiling, berming, cover, local contacts, etc.

Migration Pathways and Exposure Potential Evaluation (if completed)

Evidence of, and the potential for, contaminant to migrate to receptors through pathways of air, soil, groundwater, surface water, sediments, or subsurface utility lines
Identification and initial evaluation of known and potential human exposure to contaminants present at the facility by inhalation, dermal contact or ingestion of contaminants
Drinking water from well
Drinking water from public supply (aquifer contaminated or pipe permeated)
Vapors migrating inside or damaging buried utility
Vapors migrating into structure
Direct dermal contact with surface (< 2ft bgs) contamination

Discussion and Evaluation

Technical conclusions and recommendations; must be stated with reasonable professional certainty and under the standard of care applicable and must include at least a discussion of the following:

- Source of the release
- Current extent of and potential for the release to migrate (determined with field or laboratory analytical detection equipment) in or through the following media:
  - Soil – lateral and vertical extent of fuel-soaked soil
  - Water – dissolved phase (water soluble constituents)
  - Air – vapor phase
- Aerial extent of free product and the potential for free product to migrate
- Contamination of soil, groundwater and air; discussion of analytical results; direction of transport; potential receptors of contamination (including utility corridors) from each medium; known, probable and possible impacts to human health and environment from contaminated soil, groundwater, vapors

Conclusions

Summarize the extent and magnitude of contamination
Threats to human health and the environment (present and potential)
Discussion of sampling results in comparison to regulatory standards and screening levels
Discussion of vertical extent of soil contamination and potential for future leaching to groundwater
Discussion of fate and transport of contaminants from known and suspected sources

Remedial Action Alternatives Analysis (if completed)

Remedial alternatives analyses may also be prepared as stand-alone reports following completion of remedial investigations. A stand-alone report format can be found under Remedial Alternatives Analysis Report (RAA-01).

The PTS project manager will provide specific guidance on how to prepare and submit alternatives analysis information and which remedial alternatives to evaluate.

Description of remedial actions being evaluated
- Discussion of how remedial actions were chosen for further evaluation
- Detailed description of each remedial action proposed

Evaluation and comparison of proposed remedial actions
- Discussion of how each remedial alternative achieves comparison criteria
- Cost
- Performance: protection of human health and the environment
- Performance: environmental requirements, criteria or limitations
- Reliability
- Implementation
- Safety
- Effects on public health and the environment
- Table summarizing comparison of remedial alternatives against evaluation criteria
- Discussion and selection of best remedial action based on comparison of evaluation criteria

Implementation considerations
- Sampling or treatability studies required to finalize the proposed remedial action design
- Confirmation sampling required to confirm compliance with cleanup goals following completion of the proposed remedial action

Recommendations

Additional data collection, next phase of investigation (corrective action, second phase of remedial investigation, ongoing groundwater monitoring, no further action)
Immediacy of corrective action if required
Projected future monitoring needs and justification for all other work proposed for the site
Signature page (signed and dated)

Limitations

References

Appendices (include only those that apply)
Sampling methods
Boring logs
Well completion logs
Vapor logs
Field data sheets
Other logs
Sampling summary tables that clearly identify by the date on which the samples were taken all of the following: sample ID number, sampling location, sample type, date analyzed, laboratory conducting the analysis, analytical method, and results of the analysis
Laboratory reports that include:
- Original (or copy of original) sample concentration reports
- Chain of custody documentation
- Sample receipt checklist(s)
- Quality assurance/quality control report(s)
- Chromatograms
- Other data

EPA notification forms
QA/QC plan (unless on file with DEQ or supplied with workplan)
SOP (unless on file with DEQ or supplied with workplan)

Note: Throughout the process of investigation and remediation of a release from an underground storage tank, many reports may be prepared and submitted to the regulatory agency. Basic reports that will be required on most sites include Site Investigation Reports and Groundwater Monitoring Summary Reports.

DEQ-PTS requires a certain amount of detail in these reports. A large amount of this detail will be duplicated from report to report. The facility location, geology, hydrogeology and sampling protocols should not change significantly. Certain sections of some reports may be excerpted from other reports with little or no modification (e.g., sampling protocol followed for drilling or groundwater sampling, QA/QC procedures, etc.). Tables and maps need to be updated if they include new data, but no major changes are normally needed. The appendices of the document may be from other sources (e.g., sample results from the laboratory) or duplicates (e.g., standard sampling protocol followed). Once a Remedial Investigation Report is prepared for a site, subsequent reports should take less time, effort, and cost to prepare.

Standardized Report for an Additional Remedial Investigation (Report RI-02)
Montana Department of Environmental Quality Petroleum Technical Section (PTS)

The following lists minimal requirements for an Additional Remedial Investigation Report. Some of the listed sections may not apply to the scope of work conducted under the approved RI CAP for the release. Omit any section in the Standardized RI Report which does not apply to the scope of work conducted under the RI CAP, and provide an explanation for the omission in the RI Report.

A Remedial Investigation is intended to determine the full extent and magnitude of contamination associated with a petroleum release and to evaluate the risk it poses to human health and the environment. Following the collection and analysis of field data, it may become apparent that additional investigation will be required to determine the full extent and magnitude of contamination or to evaluate the risk it poses. One or more additional investigation efforts may be required to gather and assess all the necessary information. The PTS project manager will use professional judgment to determine what types of additional investigations or information gathering is necessary to adequately document site conditions and evaluate risk.

Each additional phase of investigation work will produce a report to document current site conditions. Unless specified by the PTS project manager, each remedial investigation report must stand-alone and contain a full breadth of knowledge about the release. An Additional Remedial Investigation Report should not repeat raw data from earlier reports such as laboratory analytical reports, boring logs, field observations, or similar kinds of information unless it is relevant and necessary for the current discussion. Summarizations of data such as maps, tables of sample results, and diagrams are appropriate to repeat in Additional Remedial Investigation Reports.

The report format listed herein includes most of the typical technologies that could be required as part of a remedial investigation, but not all of these sections may be required for individual release sites. When sections of this report format are not included in the remedial investigation, omit those sections and make a brief annotation in the report that they were not required.

The following is an example of minimal requirements for a Remedial Investigation Report. If any of the topics do not apply to your situation, please omit the section and provide an explanation in the report.

<u>Title Page</u>
Title of report [“Phase (#) Remedial Investigation for…”]
Facility name
Facility address
DEQ Facility ID number and Release number
Responsible party’s name, mailing address and phone number
Consultant’s name, address and phone number
Contact person’s name, mailing address and phone number (if different from above)
Date report prepared
Title and date of approved RI CAP

Executive Summary

Highlights the significant methods of investigation, findings, conclusions, and recommendations of the investigation

Table of Contents

Includes titles of report sections and page numbers (please use naming/numbering methodology for main sections listed herein)
List of tables and figures
List of appendices

Background (updated from previous RI reports)

When, how, and by whom contamination was discovered
Type of products stored at site
Type of contamination
When and who reported the release to DEQ
Summary of initial actions undertaken and by whom
Summary of regulatory history
Current site status - what work has already been done and what do we already know about the release and its potential threats to human health and the environment?

Purpose and Objectives of Investigation

Specific goals of this investigation
Identify general tasks, state the purpose and objectives of each task

Site History (if completed)

If a Site History was requested and completed during the currently reported phase of work, then complete all sub-sections in this report.

If the currently reported phase of work adds information to a previously reported Site History, then include those sub-sections that would be updated with the new information, and note that other sections remain unchanged and cite the previous report that includes the information.

If some aspect of a previously reported Site History is unchanged, but it is important to interpretation of the currently reported work, then repeat it in this report and note its relevance.

The DEQ project manager may request an updated Site History to compile or consolidate information located in previous reports.

History of the ownership and operation of the facility since at least the time at which the release from the tank could have occurred, including the following:

The name, current address and telephone number of all current owners and operators
The name, current address and telephone number (if known) of all past owners and operators
The years of current and past ownership and/or operation
A description of the activities conducted at the site by each current and past owner/operator
A general construction history of the site

Former and existing hazardous material/waste storage areas, lagoons and waste pits
Waste management history

History of the operation of ASTs and USTs since at least the time at which the release from the tank could have occurred at the site, including the following (some or all of this information may be presented in tabular form):

Dates of installation and removal of all existing and former tanks located on the site
Volume(s) of tank(s)
Tank and piping construction material
Tank configuration, piping layout, check valves
Overfill/spill protection
Cathodic protection
Date and description of repairs, replacements, modifications to tanks and ancillary equipment
Condition of tank(s)/piping if removed, location and size of perforations
Method and results of product inventory reconciliation (describe and attach copies of product inventory charts)

A description of all known and suspected leaks, spills, overfills or other releases from the UST, ASTs, and any other petroleum sources located on the site. The following information should be included for each occurrence:

Date of release
Date release was reported to the department
Type(s) of product released
Quantity released
Quantity recovered
Known or suspected cause of the release
Location of the release on the site
Cleanup action taken
Off-site effects

Maps and Site Technical Information

All maps and technical information should be re-submitted from previous RI reports and updated where appropriate.

Include a facility site map or maps with descriptions or symbols appropriate in scale and scope showing the following within a 500-foot radius of the site (unless otherwise noted):

Existing and former USTs, ASTs, piping, dispensers, and other sources of petroleum
Soil boring, test pit, other sample locations (if completed)
Locations of any other environmental samples collected
Monitoring wells (if completed)
Recovery wells (if completed)
Other remediation equipment (if installed)
Underground utilities on and adjacent to the property (sewer, water, telephone, electric)
Above ground utilities (overhead wires)
Basements and tile drain and sump systems on the facility and adjacent to the property
Existing and former hazardous material/waste storage areas

Adjacent buildings (structures)
Domestic, municipal, and irrigation wells
Local map (2-3 city block area) showing utilities, residences, wells, business or building use (children's nursery or machine shop?), potential third parties depending on contamination type, property lines, magnitude and extent of soil and groundwater contamination
Topographic map of the site and surrounding area
Surface water technical information and map(s), including:
Location and use of all surface water within 1 mile of site
Groundwater/surface water discharge points
Sampling description
Results of laboratory analyses
Site map showing the aerial extent of free product based on subsurface investigatory methods (e.g. monitoring wells, soil borings, or direct push technology)
Location, ownership, use, and construction of all municipal, domestic, irrigation, industrial and monitoring wells within ½ mile of the site

Receptor Survey

Identify of all potential receptors and migration pathways in the area of contamination and possible migration (summarize and updated receptors and migration pathways identified in previous RI reports).

Exposure potential discussion (summarized and updated discussion from previous RI reports)

Extent and Magnitude of Contamination

Repeat and update all sections of previous RI reports. Identify those sections of reports (including maps from all sections of this report) that have changed due new or different data.

Describe evidence of releases of petroleum to the environment, including visual and olfactory evidence, results of field screening, laboratory analyses, and historical knowledge
Types, concentrations and volumes (if applicable) of all released petroleum and hazardous material detected to-date at the facility
Analytical results for each media sampled must be summarized in the text and in tables in the body of the report
Information and details on the approximate horizontal and vertical extent of soil contamination, on-site and off-site, based on best available information
Information and details on the approximate horizontal and vertical extent of free-phase petroleum, on-site and off-site, based on best available information
Information and details on the approximate horizontal and vertical extent of petroleum vapors, on-site and off-site, based on best available information
Describe and discuss the extent and magnitude of all contamination associated with this release or commingled from other sources that may have impact, potential risks to human health and the environment, fate and transport and implications for corrective action. Discuss where the contamination is, how much there is (mass and volume in each location), how it came to be located there, and where it may migrate in the future. Discuss how these data will impact an analysis of cleanup alternatives.

Soil Investigation (if completed)

If a soil investigation was completed and reported in a previous RI report, update and summarize it here. Identify those sections of the report (including maps from all sections of this report) that have changed due new or different data.

If a soil investigation was not completed in a previous investigation, report it in the following format:

- Description of soil investigation
- Description of methods (backhoe pits, borings and monitoring well installation, vapor sampling, heated headspace sampling, or other field screening methods); write a separate description for each method used
- QA/QC plan (may be on file at DEQ)
- Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ
- Description of soil from test pits, boring completion, or other sample retrieval methods
- Field screening results (visual, odors, and vapor survey results) in tabular form with date and time of measurement, depth, location, and penetration measurement if taken; time-series graphs and tables if more than one sampling period
- Isopleths of concentrations shown on a map; a cross-section of sampling results, if samples are taken from more than one depth
- Groundwater sampling results (if encountered and sampled from excavation/borings; this information may be included in groundwater investigation section),
- Depth to water and water table elevation measurements (if encountered in excavation/borings); this information may be included in the groundwater investigation section
- Soil type, thickness, and classification below the site of the release
- Unconsolidated material and bedrock type, thickness, and formation name below the site of the release
- Soil characteristics (grain size, sorting, origin, texture, permeability, classification)
- Boring logs and monitoring well logs (may be presented in an appendix), contaminant screening levels, sediment olfactory observations and vapor readings, and blow count
- Geologic cross-section from boring/excavation information (if applicable)
- Soil sample analytical results (presented in tabular form)
- Vertical extent of contamination – include an updated soil contamination extent and magnitude map if applicable
- Discussion of sampling or analytical anomalies

Groundwater Investigation (if completed)

If a groundwater investigation was completed and reported in a previous RI report, then update and summarize it here. Identify those sections of the report (including maps from all sections of this report) that have changed due new or different data.

If a groundwater investigation was not completed in a previous investigation, report it in the following format:

- Description of groundwater investigation

- Description of methods (backhoe pits, borings and monitoring well installation, vapor sampling, heated headspace sampling, or other field screening methods); write a separate description for each method used
- QA/QC plan (may be on file at DEQ)
- Detailed sampling plans and construction techniques may be referenced and placed in appendices or in standard a operating plan (SOP) on file with DEQ
- General description and characteristics of aquifers and unsaturated zones below the site of the release, including:
    - Hydraulic characteristics
    - Depth to water table (multiple measurements should be presented in a tabular format)
    - Surveyed water elevations and contours (potentiometric surface)
    - Water table piezometric surface contour map
    - Direction of groundwater flow
    - Rate of groundwater flow
    - Perched or confined aquifer conditions
    - Connections to other aquifers
    - Hydrologic cross sections
- Description of monitoring well or sampling point completion (description of well, well construction methods, well construction or completion diagram); may be presented in an appendix
- Field screening results in table format with date and time of measurement, depth, location, penetration measurement if taken; time-series graphs and tables if more than one sampling period
- Results of laboratory analyses (multiple measurements should be presented in a tabular format)
- Isopleth (iso-concentration) map depicting at least one analyte for each contaminant type (gasoline, diesel, etc.) that best depicts the extent and magnitude of that contaminant; consult the PTS project manager for selection of analytes to show
- Discussion of sampling or analytical anomalies

<u>Soil Vapor Investigation (if completed)</u>

If a soil vapor investigation was completed and reported in a previous RI report, update and summarize it here. Identify those sections of the report (including maps from all sections of this report) that have changed due new or different data.

If a soil vapor investigation was not completed in a previous investigation, report it in the following format:

- Description of vapor investigation
- Description of methods used to evaluate potential migration of petroleum vapors into utilities or structures; write a separate description each method used
- QA/QC plan (may be on file at DEQ)
- Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ
- Vapor measuring instrument calibration data
- Type(s) of instruments used for vapor measurements
- Weather conditions during collection of vapor readings

Detailed site map vapor sampling locations
Description of surface and subsurface structures that may influence the migration of vapors through the soil
Description of soil vapor sampling points and soil conditions recorded during driving of sampling points (if taken)
Field observations made during sampling
Field screening, qualitative or quantitative results in table format with date and time of measurement, depth, location, and penetration measurement if taken
Groundwater sampling results (if encountered and sampled from vapor sampling points); this information may be included in a groundwater investigation section
Depth to water and water table elevation measurements (if encountered in sampling points)
Geologic cross-section from borings/excavations showing vapor concentrations (if applicable)
Isopleths of concentrations shown on map; cross-section of sampling results if samples taken from more than one depth
Map(s) showing the extent of free product, dissolved groundwater phase, and vapors discovered in basements and other subsurface structures and utilities
Map(s) showing all structures and subsurface utilities present near the site that are, or may become, impacted by petroleum vapors associated with the release
An evaluation of the potential for petroleum vapors to migrate into structures and subsurface utilities, including calculations on vapor migration potential under existing site conditions
Discussion of sampling or analytical anomalies

Structure Vapor Intrusion Investigation (if completed)

If a structure vapor investigation was completed and reported in a previous RI report, then update and summarize it here. Identify those sections of the report (including maps from all sections of this report) that have changed due new or different data.

If a structure vapor investigation was not completed in a previous investigation, report it in the following format:

Description of vapor investigation
Description of methods used to evaluate potential migration of petroleum vapors into utilities or structures; write a separate description for each method used
QA/QC plan (may be on file at DEQ)
Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ
Vapor measuring instrument calibration data
Type(s) of instruments used for vapor measurements
Weather conditions during collection of vapor readings
Vapor sample locations shown on map
Detailed site map of vapor sampling locations with respect to petroleum contamination (soil, free product, groundwater, and soil vapors) to the extent known
Description of surface and subsurface structures that may influence the migration of vapors through the soil
Description of structure vapor sampling points and other conditions within structures that may influence sampling results

- Field observations made during sampling; inventory of petroleum products stored in or near each structure sampled
- Field screening, qualitative or quantitative results in table format with date and time of measurement
- Field screening results in table format with date and time of measurement, depth, location, penetration measurement if taken; time-series graphs and tables if more than one sampling period
- Measurements/samples collected to measure for the presence of vapors within utilities or structures
- An evaluation of the potential for petroleum vapors to migrate into structures and subsurface utilities, including calculations on vapor migration potential under existing site conditions
- Discussion of sampling or analytical anomalies

Utility Investigation (if completed)

If a utility investigation was completed and reported in a previous RI report, update and summarize it here. Identify those sections of the report (including maps from all sections of this report) that have changed due to new or different data.

If a utility investigation was not completed in a previous investigation, report it in the following format:

- Description of utility investigation
- Description of methods used to evaluate the potential for petroleum (free phase, dissolved phase, and vapors) to impact buried utilities (backhoe pits, borings and monitoring well installation, vapor sampling, heated headspace sampling, or other field screening methods); a separate description should be written for each method used
- QA/QC plan (may be on file at DEQ)
- Detailed sampling plans and construction techniques may be referenced and placed in appendices or in a standard operating plan (SOP) on file with DEQ
- Detailed site map of buried utilities and service connections showing soil contamination and investigation points
- Description of utility construction materials (including gaskets), bedding materials, and any other information pertinent to contaminant permeation or migration
- Description of test pits, boring completion, or other utility excavation/inspection
- Field observations of utility construction, contamination present, and condition of utilities; include any other observations pertinent to contaminant permeation or migration
- Field screening results in table format with date and time of measurement, depth, location, and penetration measurement if taken
- Soil sample results
- Groundwater sampling results (if encountered and sampled from excavation/borings)
- Depth to water and water table elevation measurements (if encountered in excavation/borings)
- Geologic cross-section from borings/excavations showing utility corridors in relation to contamination (if applicable)
- Observations, field screening data, and sample results from material inside utilities (vapors, water, gas, etc.) (if sampled)
- Discussion of sampling or analytical anomalies

Other Data Results (if completed)

Initial landfarming information (see DEQ landfarming application form), including location map, property ownership, identity of party responsible for tilling and testing, slope of land, soil type, clay content, depth to groundwater, surface water locations, potential environmentally sensitive receptors, nearby residences, present land use and surrounding land use, contaminated (estimated or actual) soil quantity, contaminant concentrations, tilling equipment to be used, tilling intervals, sampling tests and intervals, permits required, stockpiling, berming, cover, local contacts

Migration Pathways and Exposure Potential Evaluation (if completed)

If a migration pathways and exposure potential evaluation was completed and reported in a previous RI report, update and summarize it here. Identify those sections of the report (including maps from all sections of this report) that have changed due new or different data.

If a migration pathways and exposure potential evaluation was not completed in a previous investigation, report it in the following format:

- Evidence of or potential for petroleum and/or hazardous material migration pathways by air, soil, groundwater, surface water, sediments and subsurface utility lines
- Identification and initial evaluation of known and potential human exposure to petroleum and hazardous material present at the facility by inhalation, dermal contact, or ingestion of contaminants
- Drinking water from well
- Drinking water from public supply (well contaminated or pipe permeated)
- Vapors migrating inside or damaging buried utilities
- Vapors migrating into structure
- Direct dermal contact with surface (< 2ft bgs) contamination

Discussion and Evaluation

Technical conclusions and recommendations, which must be stated with reasonable professional certainty and under the standard of care applicable, must include at least a discussion of the following:

- Source of the release
- Current extent of and potential for the release to migrate (determined with field or laboratory analytical detection equipment) in or through the following media:
    - Soil – lateral and vertical extent of fuel-soaked soil
    - Water – dissolved phase (water soluble constituents)
    - Air – vapor phase
    - Aerial extent of free product and the potential for free product to migrate
- Contamination of soil, groundwater, air; discussion of analytical results, direction of transport, potential receptors of contamination (including utility corridors) from each medium; known, probable and possible impacts to human health and environment from contaminated soil, groundwater, and vapors

Conclusions

Summarize extent and magnitude of contamination

Threats to human health and the environment (present and potential)

Discussion of sampling results in comparison to regulatory standards and screening levels
Discussion of vertical extent of soil contamination and potential for future leaching to groundwater
Discussion of fate and transport of contaminants from known and suspected sources

Recommendations
Additional data collection, next phase of investigation (e.g., corrective action, second phase of remedial investigation, ongoing groundwater monitoring, no further action)
Immediacy of corrective action if required
Projected future monitoring needs and justification for all other work proposed for the site
Signature page (signed and dated)

Limitations

References

Appendices (include only those that apply)
Raw data from earlier reports such as laboratory analytical reports, boring logs, field observations or similar kinds of information, unless it is relevant and necessary for the current discussion; raw data collected during this investigation or data that has not been presented in previous reports should be included in this report

Sampling methods
Boring logs
Well completion logs
Vapor logs
Field data sheets
Other logs
Sampling summary tables that clearly identify by the date on which the samples were taken all of the following: sample ID#, sampling location, sample type, date analyzed, laboratory conducting the analysis, analytical method, and results of the analysis
Laboratory reports that include:
- Original or copy of original sample concentration reports
- Chain of custody documentation
- Sample receipt checklist(s)
- Quality assurance/quality control report(s)
- Chromatograms

Other data
EPA notification forms
QA/QC plan (unless on file with DEQ or supplied with workplan)
SOP (unless on file with DEQ or supplied with workplan)

Note

Throughout the process of investigation and remediation of a release from an underground storage tank, many reports will be prepared and submitted to the regulatory agency. Basic reports that will be required on most sites include Site Investigation Reports and Groundwater Monitoring Summary Reports.

DEQ PTS requires a certain amount of detail in these reports. A large amount of this detail is duplicated from report to report. The facility location, geology, hydrogeology and sampling protocols should not change significantly. Certain sections of some reports may be excerpted from other reports with little or no modification (e.g., sampling protocol followed for drilling or groundwater sampling, QA/QC procedures, etc.). Tables and maps need to be updated if they include new data, but no major changes are normally needed. The appendices of the document may be from other sources (e.g., sample results from the laboratory) or duplicates (e.g., standard sampling protocol followed. Once a Remedial Investigation Report is prepared for a site, subsequent reports should take less time, effort, and cost to prepare.