



Alberta Risk Management Plan Guide

October 31, 2017

Title:	Alberta Risk Management Plan Guide
Number:	AEP Land Policy 2017 No. 2 - Alberta Risk Management Plan Guide
Program Name:	Land Conservation and Reclamation Policy Section; Land Policy Branch
Effective Date:	October 31, 2017
This document was updated on:	
ISBN 978-1-4601-3610-2 (On-line Edition)	

This document may be referenced as:

Alberta Environment and Parks (AEP), 2017. *Alberta Risk Management Plan Guide*.

Web Site: aep.alberta.ca

Any comments, questions or suggestions regarding the content of this document may be directed to:

Land Policy Branch
 Policy and Planning Division
 Alberta Environment and Parks
 10th Floor, Oxbridge Place
 9820 – 106 Street NW
 Edmonton, Alberta T5K 2J6
 Fax: 780-422-4192
 Email: Land.Management@gov.ab.ca

Additional copies of this document may be obtained by contacting:

Information Centre
 Alberta Environment and Parks
 Edmonton, Alberta
 Phone: 780-427-2700
 Fax: 780-422-4086
 Email: AEP.Info-Centre@gov.ab.ca

Table of Contents

Definitions.....	5
1. Introduction.....	7
1.1 Purpose.....	7
1.2 Relationship to Other Documents.....	8
1.3 Scope and Applicability of this Document.....	8
2. Risk Management for Contaminated Sites.....	10
2.1 Exposure barriers.....	11
2.2 Administrative Controls.....	12
3. Administrative Requirements.....	13
3.1 Completed Reviewer’s Checklist.....	13
3.2 Site Identification and Physical Location.....	13
3.2.1 Site Name and Location.....	13
3.2.2 Site File Identification Information.....	14
3.3 Proponent Information.....	14
3.4 Consultant Information.....	15
3.5 Record of Site Condition.....	16
3.6 Outstanding Legal Requirements.....	16
4. Site Investigation Requirements.....	17
4.1 Background Site Information.....	17
4.2 Conceptual Site Model.....	18
4.2.1 Site Description.....	19
4.2.2 Site Investigations, Contaminant Characteristics and Migration.....	19
4.2.3 Land Use Description.....	20
4.2.4 Regional and Site Processes.....	20
4.2.5 Summary.....	20
4.3 Contaminants of Potential Concern.....	20
4.4 Risks Associated with Current Site Conditions.....	21
4.5 Land Use and Zoning.....	21
4.6 Remediation Guideline Section.....	22
4.7 Complete Delineation.....	23
4.8 Evaluation and Management of Source and Heavily Impacted Media.....	24
4.8.1 Source Removal and Control.....	25
4.8.2 Contaminant Concentrations above Management Limits.....	26
4.8.3 Evidence of Non Aqueous Phase Liquids.....	26
4.8.4 Identification of Heavily Impacted Media.....	26
4.8.5 Preferential Flow Paths.....	28

4.9 Soil Vapour Evaluation and Management – Volatile and Semi-Volatile Contaminants.....	28
4.10 Observation and Adverse Effects.....	30
4.11 Acute, Sub-chronic, and Chronic exposure.....	30
4.12 Human Health Exposure via Direct Contact or Ingestion Pathways.....	31
4.13 Sufficient Concentration to Alter Physical or Chemical Properties.....	32
5. Implementation Requirements.....	33
5.1 Summary of Requirements and Conditions.....	33
5.2 Risk Evaluation.....	34
5.3 Monitoring Plan.....	34
5.4 Contingency Plan.....	36
5.5 Timelines and Plan Requirements.....	37
5.6 Communication Plan.....	37
5.7 Obligations for Long-Term Care and Control	39
6. References.....	40
Appendix A – Review Checklist for Risk Management Plans.....	41
Appendix B – Person(s) Responsible – Risk Management Plan Commitment (Sample).....	56
Appendix C – Affected Third Party – Risk Management Plan No Objection (Sample)...	57
Appendix D – Affected Third Party – Risk Management Plan Notification (Sample).....	58

Definitions

For the purpose of the Alberta *Risk Management Plan Guide*, the following definitions apply. In the event that there is discrepancy from those defined within Acts or Regulations, the Acts and/or Regulations shall take precedence.

Acute Effect: an effect resulting from exposure by the oral, dermal or inhalation route for short periods of time, usually 24 hours or less. In the context of this document this also includes receptor safety.

Adverse Effect: means impairment of, or damage to the environment, human health or safety or property, as defined in EPEA.

Area(s) of Potential Environmental Concern (APEC): any area on, in or under the site and surrounding area where one or more contaminants of potential concern may be present, as identified through an initial Phase 1 or other investigation, and that has not been ruled out through subsequent Phase 2 investigations.

Chronic Effect: an effect that occurs to a human or ecological receptor as a result of repeated or long term exposure(s) to a hazardous contaminant.

Conceptual Site Model (CSM): a visual representation and narrative description of the physical, chemical and biological processes occurring, or that have occurred, at a site, as related to contaminants of potential concern and their migration.

Contaminant(s) of Potential Concern (CoPC): any substance that is identified as potentially present on, in or under a site and surrounding area that, if released, has the potential for adverse effect.

Contaminant Sources: a substance release that must be remediated, removed or managed.

Contingency Plan: a supplemental plan that will be implemented to address the contamination if a RMP fails to address risks associated with the site or a worsening contaminant scenario occurs (e.g. adverse effects, migration, affecting additional receptors, etc.).

Environmental Site Assessment (ESA): an investigation in relation to land to determine the environmental condition of property. It includes a Phase 1 environmental site assessment, Phase 2 environmental site assessment and confirmatory investigation.

EPEA: Environmental Protection and Enhancement Act (RSA 2000, cE-12).

Exposure Control(s): Alberta's *Exposure Control Guide* (2016b) defines exposure control as risk management through use of site-specific exposure barriers and/or administrative controls on contaminated land. Source removal and control must occur before exposure control can commence.

Point of Compliance: the geographic location at which the concentration of the contaminant of potential concern is to be at or below the appropriate Tier 1 or Tier 2 guideline.

Risk Management Plan (RMP): Risk management involves the identification of risk and the application of control measures, such as remediation and exposure controls, to reduce or eliminate risks that are not

acceptable. A Risk Management Plan is a plan that involves the use of Exposure Control to control risks posed by one or more contaminants of potential concern within one or more areas of potential concern.

Source: anything that adds contaminant mass to the environment.

Sub-chronic Effect: an effect resulting from repeated exposure by the oral, dermal, or inhalation routes for more than 30 days, up to approximately 10% of the lifetime of a human or ecological receptor.

Introduction

1.1 Purpose

The purpose of the *Alberta Risk Management Plan Guide* (“RMP Guide”) is to provide Alberta Environment and Parks’ (AEP; “Department”) policy for risk management plans (RMPs) for contaminated sites in Alberta. This document applies when assessing exposure control as an option for managing contaminated land in Alberta. It provides guidance on the Department’s and the Alberta Energy Regulator’s (AER; “Regulator”) requirements for risk management plans.

This document is intended to be used for the preparation of RMPs submitted to the Department or Regulator for any type of contaminated site. It outlines the information that must be contained in a complete RMP submitted to the Department or Regulator.

The RMP Guide is intended to be used by site managers, environmental professionals and project managers who develop, implement and maintain RMPs. Environmental professionals must have related experience and thorough understanding of contaminated sites, environmental site assessment and remediation. Users are to be familiar with existing provincial legislation, regulations and related guidance documents as well as applicable federal guidance and protocols.

Proponents planning to use exposure control to manage risks at a contaminated site must also refer to the *Alberta Exposure Control Guide* (AEP, 2016b) for more information.

This document also includes appendices that support the information contained within the body.

- **Appendix A** provides guidance in the form of a Review checklist for Risk Management Plans, for aid in developing RMPs submitted to the Department or Regulator. Requirements for approval review contained in Appendix A must be presented as an appendix table as part of the RMP submission to help in the RMP review process with the Department or Regulator.
- **Appendix B** provides a sample RMP commitment letter for the person(s) responsible.
- **Appendix C** is a sample letter for third parties to provide a statement of no objection to a RMP being undertaken on property affected by contamination and/or exposure control activities.
- **Appendix D** illustrates a sample notification letter for third parties whose property may be affected by contamination and/or exposure control activities.

1.2 Relationship to Other Documents

Alberta's policy for risk management at contaminated sites has been stated in various remediation guidelines developed and implemented by the Department in the province since 1991, including: the *Subsurface Remediation Guidelines for Petroleum Storage Tank Sites* (Alberta MUST Project, 1991; AENV, 1994); *Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities* (AENV, 2001a); the *Risk Management Guidelines for Petroleum Storage Tank Sites* (AENV 2001b); and the *Salt Contamination, Assessment and Remediation Guidelines* (AENV 2001c). The underlying framework for these guidelines was the model originally established by the Canadian Council of Ministers of the Environment (CCME) in support of the National Contaminated Sites Remediation Program and is reflected in several of their current and historical documents (CCME, 1996, 1997, 2006), and outlined in Alberta's *Contaminated Sites Policy Framework* (ESRD, 2014a).

This document supports provisions outlined in Alberta's *Contaminated Sites Policy Framework* (ESRD, 2014a). It is a companion document to the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (Alberta Tier 1 guidelines; AENV 2007a, as amended), *Alberta Tier 2 Soil and Groundwater Remediation Guidelines* (Alberta Tier 2 guidelines; AENV 2007b, as amended), *Environmental Guidelines for Alberta Surface Waters* (ESRD, 2014b), the *Environmental Site Assessment Standard* (AEP, 2016a), and the *Alberta Exposure Control Guide* (AEP, 2016b). The RMP Guide works in association with existing policy documents, and builds upon on principles for exposure control and requirements for RMPs outlined in the *Alberta Exposure Control Guide* (AEP, 2016b).

1.3 Scope and Applicability of this Document

Contaminated sites are created by the release of a substance(s) to the environment. Regulatory concerns arise at these sites when the released substances may be or are capable of causing **adverse effects** to human health, the environment, safety or property. Releases or public complaints are to be reported to the Department via the 24-hour Energy & Environmental Response Line at 1-800-222-6514 (AEP, 2016c).

Where a substance release has occurred, the Department's and Regulator's policies promote the return of contaminated sites to productive use and to ensure that risks to human health and the environment are minimized (ESRD, 2014a). For regulatory closure, the Department and Regulator distinguish sites that are remediated to Alberta Tier 1 or Tier 2 guidelines from those that are managed by exposure barriers and administrative controls. Sites managed with exposure control measures are not eligible for regulatory

closure. Remediation is the preference of the Department and Regulator, and those sites remediated to meet the applicable guidelines are eligible for regulatory closure, such as with a Remediation Certificate.

Exposure control may be required to manage residual contamination on sites where long-term remediation is being undertaken and/or on sites that exhibit technical constraints, physical limitations or situations where remediation cannot achieve Alberta Tier 1 or Tier 2 guidelines. A RMP is required when exposure control is selected as a risk management option.

Certain circumstances will preclude the selection of exposure control for risk management as a primary strategy for the management of contaminated sites (AEP, 2016b). If risks cannot be managed at a site, it is the proponent's responsibility to ensure that the site is remediated to the appropriate risk-based objectives based on either Alberta Tier 1 or Alberta Tier 2 guidelines.

2. Risk Management for Contaminated Sites

Options for managing contamination at sites in Alberta include:

- Remediation to Alberta Tier 1 generic remediation guidelines.
- Remediation to Alberta Tier 2 modified generic remediation guidelines where site-specific conditions modify the generic conditions used to derive Alberta Tier 1 guidelines.
- Exposure Control, which includes the use of exposure barriers and/or administrative controls to minimize risks to human health and the environment.

Regardless of the option chosen, Alberta Tier 1 and Tier 2 guidelines provide the same target level of human health and ecological protection.

Remediation to Alberta Tier 1 or Tier 2 guidelines is preferred by the Department and Regulator. Exposure Control is not to be considered a viable option where remediation to Alberta Tier 1 or Tier 2 is practicable in a timely manner. Demonstrated risk (adverse effect) to human health and/or the environment requires remediation, regardless of whether or not the site has an acceptable RMP or meets Alberta Tier 1 or Tier 2.

Exposure control may need to be considered on an interim basis where meeting Alberta Tier 1 and/or Tier 2 guidelines involves long-term remediation. Exposure control(s) are site-specific exposure barriers and/or administrative controls on contaminated land, as outlined in the *Alberta Exposure Control Guide* (AEP, 2016b). This management option involves preventing or controlling exposure to contaminants by various means as an alternative to complete remediation. For example, this can be accomplished by providing physical or chemical barriers to exposure and/or by implementing administrative controls on a subject property. These options normally require long-term, potentially permanent, care and control, and ongoing monitoring by the proponent. Where a source of contamination still exists, these options require source removal and control before the approval of a RMP.

A RMP provides a procedure for exposure-control measures to ensure risks to human health and the environment from contaminants of potential concern (CoPCs) are being managed at a site. Actions must be taken to ensure exposure-control measures are implemented and maintained according to the requirements of the RMP and throughout the lifetime of the RMP. A RMP typically includes administrative and/or exposure-control measures, monitoring, a contingency plan, and a plan to communicate with stakeholders.

Depending on the nature of the site and level of risk posed by the contaminants to the receptors, RMPs will vary in the complexity, inspection requirements, notification requirements, the type and extent of monitoring, and contingency plan requirements. Risk management plans can vary in scope from relatively

simple notification of requirements to inform stakeholders, to very complex plans involving requirements for detailed engineering plans, legal instruments, schedules for inspections, monitoring, maintenance and contingency plans related to the control measures and the site.

Exposure controls require sufficient details and data to support their use. Supporting information for exposure controls must be provided to describe the type of controls being used and how they are implemented and monitored for effectiveness. Exposure controls must be supplemented with soil, groundwater and/or vapour monitoring information for verification and to assess the effectiveness of the RMP.

2.1 Exposure barriers

Exposure barriers are a form of exposure control for managing risks to human health and the environment from exposure to substances by the use of a technology that:

- Prevents, minimizes or mitigates the release of the substance and associated breakdown or transformative products if applicable;
- Controls or contains the migration of a substance both on-site and off-site;
- Prevents, minimizes or mitigates exposure of the substance to the receptor of concern; or
- Prevents the remediated area from being contaminated by the migration of risk-managed substances.

Examples of site-specific risk management by exposure barriers include, but are not limited to:

- Soil cover and/or hard surfaces to prevent direct exposure to contamination.
- Impermeable barriers and liners to prevent water infiltration and/or contaminant migration.
- Sub-floor vapour-control systems or barriers to prevent ingress of volatile compounds into buildings.
- Fencing around a property to restrict access.
- Binding chemicals within a soil-cement matrix to reduce bioavailability.
- Groundwater recovery and control systems.

Systems that require more active maintenance, such as fans or pumps, are less-reliable for longer-term exposure control. Active systems will require ongoing maintenance and upkeep to ensure longer term viability. This type of exposure control will be more difficult for the Department or Regulator to accept due

to the longer term care and control requirements attached to the RMP and the increased difficulty in demonstrating long term viability of the RMP.

Exposure controls are to be monitored and reported regularly to ensure ongoing effectiveness. Best available technology shall be used. Professional oversight is required in determining the appropriate technology.

2.2 Administrative Controls

Administrative Controls are a form of exposure control for managing risks to human health and the environment from exposure to substances by the imposition of legal or administrative requirements that limit exposure to soil, water, sediment, or vapour at a site.

Examples of site-specific exposure control by administrative controls include, but are not limited to:

- Security programs to restrict access to a contaminated site.
- Establishing discretionary land uses through consultation with zoning authorities and land use bylaws.
- Groundwater use restrictions.
- Worker health and safety programs.
- Contingency soil and groundwater management plans in the event of future excavation(s).
- Land use and building placement restrictions on a property.
- Restrictions for design, installation and maintenance of utility service lines.
- Restrictive covenants and caveats on land titles aimed at development restrictions.
- Contract provisions for third party risk management obligations.
- Programs to prevent activities that place humans or the environment at risk.

When exposure barriers are used, administrative controls are often also necessary to continually maintain the effectiveness of the exposure control.

3. Administrative Requirements

Section 3, *Administrative Requirements*, outlines basic minimum information that is administrative in nature and that must be included in a RMP that is submitted to the Department or Regulator. This information is used for ascertaining the site location and current site status.

3.1 Completed Reviewer's Checklist

Appendix A, *Review Checklist for Risk Management Plans*, is used to assist with Guide information. This review checklist must be completed and submitted by the professional in an appendix to the RMP.

3.2 Site Identification and Physical Location

The site name and location of the RMP-subject site are required. If contamination has migrated off-site, the location of any affected adjacent lands must also be provided.

3.2.1 Site Name and Location

A Plan, Block, Lot (PBL) and/or Alberta Township System (ATS) legal land description (LLD) with GPS coordinates (NAD83) must be provided for all lands that are the subject of the RMP.

Where applicable, municipal (street) addresses must be included for the subject site and any other affected adjacent lands. For RMPs involving more than one property (e.g., where the RMP extends beyond a single property boundary), the address(es) for the source property(ies) that was/were the original source(s) of contamination must be listed, and any other affected adjacent lands. For sites without an available address, the municipality at city or county level must be used. A mailing address, post office box or rural route is not acceptable as the site address.

Plans must include scaled maps, drawings, surveys, etc. overlaid with a PBL and/or LLD map that allow for identification of all source and affected adjacent lands. When a site is a registered or licensed commercial or industrial operation, the legal name of the operation or site must be provided. If the site is transitory or temporary, such as, but not limited to, those sites located along transportation corridors (ex.: accidents, rollovers), spills and releases, temporary work areas, include the legal name of the operator responsible for the substance that was released during transport. For other instances, a site name will need to be chosen that reasonably describes the area of interest.

3.2.2 Site File Identification Information

Department file number(s) or site number(s) (or applicable Regulator file numbers) must be referenced for identification. This includes, but is not limited to: a petroleum storage tank site (PST) reference number, a contaminated site (SCD or CSU) reference number, EPEA Approval number, or Call Reference number. Other file numbers that may be referenced include the Petroleum Tank Management Association of Alberta (PTMAA) identification number, if applicable. The Proponent must provide verification that the release has been reported to AEP or AER (via the 1-800-222-6514 reporting number) and has received a Call Reference number.

3.3 Proponent Information

The *Contaminated Sites Policy Framework* (ESRD, 2014a) describes the role and responsibility of the proponent, which includes but is not limited to an owner or operator. For an ongoing RMP, a proponent must take responsibility for the long term viability of the RMP. Information regarding the owner and operator and occupant, if different from those noted, must be provided as part of the administrative requirements.

An owner or operator is the party legally authorized to run an industrial or commercial site and has administrative control of the property. Common types of owners and/or operators for contaminated sites may include:

- Legal registered current owner of the land in the Alberta Land Titles Spatial Information system
- The fuel station license holder and a PTMAA registered storage tank operator.
- An AER license, permit or approval holder for oil and gas activities.
- An EPEA Approval holder for an approved facility.
- A registration holder under various Codes of Practice.
- Any other license or registration holder of other activities not included in the above list.
- A new owner who has care and control of development or redevelopment of the land in urban and rural areas.

Information required from the Proponent includes:

- **Company name:** the registered legal name of the owner and/or operator.
- **Mailing address:** the company's mailing address for correspondence.
- **Contact person:** the person that represents the company for stakeholder communication. The contact person identified must have sufficient authority to deal with issues relevant to the RMP.

Business contact information for this person, including position, phone number, fax number and email address must be provided.

- **Name of any occupants and/or lessees:** the contact information for any occupants and/or lessees of the site or properties covered by the RMP.
- **Receiver** where one has been appointed under bankruptcy proceedings.

3.4 Consultant Information

The consultant information identifies the environmental consulting firm that prepared the RMP. The consultant identified in this section is the lead consultant responsible for ensuring completeness and accuracy of the RMP proposal.

Risk management plans must be prepared by a qualified Environmental Professional. Professional sign off including signature(s) and professional stamp(s) are required for all proposals and reports prepared and submitted to the Department or Regulator, and the consultant identified must be a qualified member of a regulated professional organization:

- Alberta Institute of Agrologists;
- Alberta Society of Professional Biologists;
- Association of Professional Engineers and Geoscientists of Alberta;
- Association of the Chemical Profession of Alberta;
- College of Alberta Professional Foresters;
- College of Alberta Professional Forest Technologists; or the,
- Association of Science and Engineering Professional Technologists of Alberta.

Professionals must have a minimum of five years verifiable experience in remediation, as outlined in the *Competencies for Reclamation and Remediation Advisory Committee Recommendations Report* (AENV, 2006) and carry adequate insurance, including but not limited to, general liability and errors and omissions insurance.

RMPs will be considered for review by the Department or Regulator when presented as complete, finalized documents that are not in the “draft” stage of development.

Information required from the consultant includes:

- **Company name:** registered legal name of the consulting firm.
- **Mailing address:** company’s mailing address for correspondence.
- **Contact person:** contact information for the person(s) representing the consulting firm.

3.5 Record of Site Condition

A Record of Site Condition (RSC) (AENV, 2009) must be completed to accurately reflect the current status of the site. Upon submission of a RMP, Section 7 of a RSC must be completed as defined above and signed.

3.6 Outstanding Legal Requirements

Identify details of any federal, provincial or municipal requirements, or charges or orders that may be attached to the site.

4. Site Investigation Requirements

Section 4, *Site Investigation Requirements*, outlines basic minimum information that is technical and/or site-specific in nature and that must be included in a RMP.

Full delineation of contaminant(s) is required to complete any risk assessment or risk management plan (ESRD 2014a). All risks from Area(s) of Potential Environmental Concern (APECs) or CoPCs must be considered in the scope of the RMP. If a CoPC or receptor is missed, the RMP will require revision. If a CoPC or receptor is cannot be mitigated, the RMP will be negated, and the proponent must pursue remediation.

The RMP must provide clear and unambiguous conclusions that there are no unacceptable risks to receptors. If unacceptable risk to receptors is apparent, acceptance of (or reliance on) the RMP is unlikely, and remediation will be required. While it may be possible to manage risks to ecological receptors where impacts are already observed and where conditions are improving, this situation requires a detailed environmental impact assessment as defined by EPEA. Risks to human health are not acceptable. RMPs where risks to human health remain will need to be re-evaluated.

Site investigation requirements may already be available in reports previously filed with the Department and/or Regulator. It is not necessary to resubmit this information as part of the RMP. It is, however, required that this information be summarized in the RMP and the RMP must reference the background reports, including clear references to the report section(s) that provide the appropriate information. Clear, unambiguous links to the appropriate information in the supporting documents must be provided. The Department or Regulator may reject any plan where information is not clear or is difficult to follow.

In developing a risk assessment, assumptions requiring a RMP can only be included after acceptance of the necessary RMP.

4.1 Background Site Information

A summary of the background site information must be supplied as part of the RMP information, and be extensive enough to provide an understanding of the risks to human or ecological receptors and associated pathways, nature and extent of contamination for each managed APEC. Some of the background site summary information will likely overlap with some information contained in the conceptual site model, or

will be used as part of the information needed to develop the basis of the conceptual site model. The background summary must provide or reference the following items:

- All previous reports produced for the site;
- The location of previous, current and proposed buildings;
- Current operating status of the site and any impacted off-site properties;
- Historical, reasonably likely future, and current site as well as adjacent land uses;
- Description of soil type governing contaminant migration, fill material, surface drainage, depth to groundwater, groundwater flow direction and hydraulic conductivity;
- Natural features including any permanent or seasonal surface water bodies to at least 300 m from the edge of the contaminant plume;
- Any existing groundwater well locations within a 300-m radius of the APECs or 300 m down-gradient and 100 m up-gradient from the edge of a defined plume;
- All previous and current soil and groundwater monitoring locations indicating depth and screening intervals;
- The location of surface and underground structures including utility services;
- Documentation of previous releases and release reporting;
- Historical soil and groundwater sampling, delineation and remediation results;
- Two-dimensional representation (2-D plan view) of all APECs, including reported concentrations of CoPCs;
- Sufficient information including cross-sections to understand vertical distribution of the CoPCs; and
- Where multiple risk management areas are proposed, vertical and horizontal representation of the various risk management areas.

The background site summary must provide sufficient information to understand risks to all receptors including sensitive receptors, if present. For sites where there are receptor characteristics that may make the site more sensitive than normal, these characteristics must also be included. Some examples may include, but are not limited to, proximity to Indigenous communities and traditional land-use areas where there is a greater than normal local food consumption rate, crop sensitivity to a particular CoPC or location of the site in an ecologically sensitive zone where protecting rare or endangered species is required.

4.2 Conceptual Site Model

A conceptual site model (CSM) is a visual representation *and* written description of the physical, chemical, and biological processes occurring, or that have occurred, at a site, as related to the contamination and

contaminant migration. Detailed background site information is used as the basis for developing the initial CSM.

While the CSM may vary in complexity based on the site conditions, at a minimum, it must be able to tell the story of how the site became contaminated (sources), how the contaminants were, are, and may be transported (migration pathways), where the contaminants will ultimately end up, and whom or what they may affect (receptors). A well-developed CSM helps to organize, communicate, and interpret existing data, while identifying areas where additional data is required. The CSM is dynamic and must be updated and shared as new information becomes available. All assumptions, calculations, statistical analyses and tables for the CSM are required in the RMP.

The CSM must provide information on the sources, types and extent of the contamination and breakdown or daughter products, its release and transport mechanisms, possible subsurface migration pathways and potential receptors and the routes of exposure. A CSM focuses on physical characteristics, geological and hydrogeological conditions, contaminant transport processes and receptors at a site. For development of the CSM, it is helpful to prepare plans and cross-sections (two-dimensional) and at least conceptually consider the three-dimensional contaminant distribution at a site. The CSM must show sufficient detail and be drawn to scale to realistically portray the characteristics of the site. Some portions of the CSM may also need to be highlighted to illustrate key components, and thus are not drawn to scale when over-emphasized for descriptive purposes. It is also essential that the CSM recognize both current and future conditions and how contamination characteristics may change over time. Specific considerations used to develop the CSM are outlined in the following sub-sections.

4.2.1 Site Description

- Location, legal description and size
- Topography
- Climate
- Buildings and surface structures
- Subsurface utilities
- Vegetation and ground cover
- Surface water (lakes, rivers, streams, wetlands)
- Surface water drainage

4.2.2 Site Investigations, Contaminant Characteristics and Migration

- Results of previous site investigations
- Contaminants of potential concern
- Contaminant sources

- Site-specific soil, geology and hydrogeology information
- Contaminant variability and trends in time and space
- Contaminant transport and fate
- Preferential pathways
- Borehole logs, depth to groundwater and other hydrogeological information
- Building characteristics and meteorology (soil vapour intrusion pathway)
- Contaminant susceptibility to various treatment or destruction options
- Active exposure pathways and receptors
- Habitat description, including receptor characteristics and activity patterns

4.2.3 Land Use Description

- Current land use
- Operating status
- Land-use designation by local authority
- Land-use restrictions
- Land-use history
- Proposed land use
- Adjacent land use(s), if applicable

4.2.4 Regional and Site Processes

- Geology
- Hydrogeology
- Hydrology
- Site topography
- Stratigraphy
- Groundwater flow
- Contaminant plume(s)
- Pathways
- Receptors
- Modifications to original landscape

4.2.5 Summary

- Known areas of environmental concern ranked and listed based on human health and ecological risk
- Areas of potential environmental concern ranked and listed based on human health and ecological risk
- Contaminants of potential concern ranked and listed based on human health and ecological risk
- Data gaps, needs, and a plan for data acquisition.

4.3 Contaminants of Potential Concern

All CoPCs, exposure pathways and receptors must be identified. If any are omitted or not evaluated properly, the RMP will be rejected by the Department or Regulator and the proponent must amend or modify the RMP and resubmit it for review.

Contaminants of potential concern must be clearly identified and include all substances that are part of the release(s), including relevant breakdown or transformative (daughter) products, and/or those exceeding applicable Alberta Tier 1 or Tier 2 guidelines. Remediation guidelines for contaminants not listed in the Alberta Tier 1 or Alberta Tier 2 guidelines must still be assessed and submitted for review and acceptance by the Director (Department and/or Regulator) (AENV 2007b, as amended). All substances identified in this section must be fully delineated and represented on a site plan or map(s) submitted as part of the RMP.

4.4 Risks Associated with Current Site Conditions

Clear and unambiguous conclusions regarding risks associated with the site condition must be presented. All relevant exposure pathways in soil, groundwater, surface water, and vapour must be discussed. The data must be summarized clearly and logically. Data must establish existing conditions with respect to CoPCs and provide rationale and conclusions regarding how the risk each relevant exposure pathway will be managed for the site to meet respective guidelines. It must include the professional's interpretation of the significance of the data as related to the RMP or eventual remediation objectives. Appropriate citations and references to standards, guidelines and sources for background concentrations, and statistical analyses used in decision making must be included. Where they exist, data uncertainty and gaps must be explicitly described.

4.5 Land Use and Zoning

For the purpose of developing and implementing soil and groundwater remediation guidelines in Alberta, five generic land uses are defined in the Alberta Tier 1 guidelines: natural areas, agricultural, residential/parkland, commercial and industrial. A generic land use scenario is envisioned for each category based on typical activities and receptors on these lands (AENV 2007a, as amended).

Where allowable land uses, as defined by a given jurisdictional authority, differ from the Alberta Tier 1 guidelines (AENV 2007a, as amended), an assessment of allowable receptors and potential exposure pathways must be completed. Where there is discrepancy between the local land use zoning and Alberta Tier 1 land use definitions, the more conservative generic land use category in Alberta Tier 1 must be used.

When preparing a RMP, the environmental professional shall provide current land use(s) and zoning designation from the applicable approval authority and verify with the landowner, municipality, county or municipal district, whether there are any existing or proposed plans to change the land use zoning for the site. Supporting documentation for future land use changes must be attached.

There may be multiple land use guidelines that apply to different portions of the area affected by the release. Thus, land uses of adjacent properties must be documented. Where a contaminated site on a less sensitive land use lies within 30 m of a more sensitive land use, the appropriate guidelines for the more sensitive land use must be applied to the contaminated site within 30 m of the more sensitive land use boundary (see Figure 1) (AENV 2007a, as amended). This may result in the proponent risk managing the entire site using protection levels for the most sensitive land use among multiple land use scenarios.

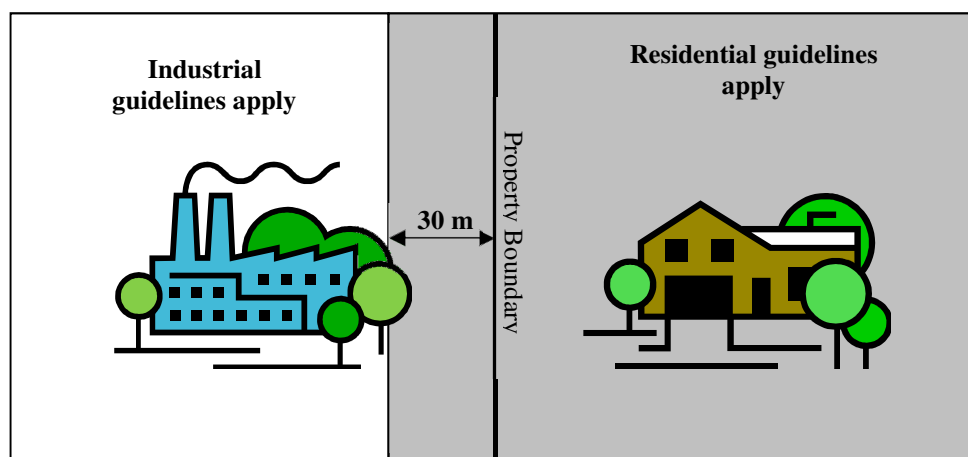


Figure 1: Example of 30 m Buffer Zone Adjacent to More Sensitive Land Use

This diagram is for illustration purposes and can be applied to any land use scenario where a more sensitive land use is adjacent to a less sensitive land use.

The end land use describes the land use of projects that are confirmed or anticipated. Where future land use or zoning changes are proposed or imminent, the proponent must document and include these considerations in the development of the RMP.

If a site is remediated, or is currently subject to a RMP, and the land use changes to a more stringent land use, the current owner of the site or the person making the change in land use must conduct additional assessment(s) and/or remediation to ensure that the conditions at the site meet the guidelines of the new land use. In such circumstances the RMP must be updated to reflect these changes.

4.6 Remediation Guideline Section

The Department's *Contaminated Sites Policy Framework* (2014) provides options for managing contaminated sites as the proponent proceeds from initial site assessment to regulatory closure. The options are:

- Remediation to Alberta Tier 1, generic remediation guidelines.
- Remediation to Alberta Tier 2, modified generic remediation guidelines where site-specific conditions modify the generic conditions used to derive Alberta Tier 1 guidelines.
- Exposure Control, risk management through exposure barriers and/or administrative controls to minimize risks to human health and the environment.

The RMP must provide a brief description of the rationale used for guideline selection, along with an explanation of whether this differs or deviates from options used in any previous ESAs or remediation work.

Where an Alberta Tier 2 option is being used (AENV 2007b, as amended), a more detailed environmental site assessment and sufficient justification must be documented or clearly referenced to reports already submitted in the RMP. Tier 2 adjustments and site-specific assumptions must be accepted by the Department or Regulator in writing prior to inclusion in the RMP. Where site-specific assumptions are being used as part of the development of the RMP (e.g. screening out of the domestic use aquifer pathway, freshwater aquatic life pathway, etc.), acceptance of site-specific guidelines must be obtained in writing from the Department or Regulator prior to proposing risk management. If the Department or Regulator has reviewed and accepted a site specific assumption, it may not be necessary to repeat the related information as part of the RMP. However, a copy of the written acceptance provided by the Department or Regulator must be included as part of the RMP. Changes in contaminant movement or incorrect assumptions about transport pathways will result in cancellation of Tier 2 exclusion(s).

As noted in the *Alberta Exposure Control Guide*, (AEP, 2016b), risk assessments are conducted without assuming any exposure control requirements unless they are accompanied by the fully developed RMP.

4.7 Complete Delineation

Vertical and horizontal delineation in soil and groundwater must be demonstrated, including off-site impacts and bedrock (if applicable). Delineation is considered complete when measured concentrations are consistently less than Alberta Tier 1 guidelines or Alberta Tier 2 guidelines developed using the pathway exclusion approach. Where no guidelines are available, the background concentration shall be used as the delineation endpoint. Phase 2 ESA reports must clearly indicate complete horizontal and vertical delineation of all CoPCs on and off site. Where this includes requirements for groundwater delineation, the vertical and horizontal groundwater flow conditions must be understood to assess risks. The level of detail required will depend on the severity of contamination and the risks associated with contamination in the groundwater.

4.8 Evaluation and Management of Source and Heavily Impacted Media

A source, as identified in Alberta Tier 1 guidelines, is anything that adds contaminant mass to the environment. If contaminants are mobile, contaminated soil and groundwater may be a source of further contamination. Sources of contamination can further degrade environmental quality by contributing to an increase in the extent and amount of contamination in the environment over time.

By definition, media containing light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) is considered a source.

Source control is a specialized area of risk management. In the case of ongoing contribution of contamination by soil and groundwater, source management can be an option if remediation and removal cannot reasonably be achieved. However, risk reduction is an important part of risk management. Source removal or recovery must always be considered first in order to reduce risk management requirements. Risk management plans that require more detailed or active source management may not be accepted if these risks can be reasonably reduced through some form of active source removal or recovery.

Source control is considered complete when monitoring data demonstrates that contaminant levels have been statistically demonstrated to be either stabilized or decreasing in all environmental media and that the degree of contamination at any point is unlikely to increase over time. Where the nature and extent of source is uncertain the greatest residual contamination must be considered as the source, for the purpose of the RMP. This is especially important for historical or recent releases where continued movement may not be certain or may not have been documented through adequate monitoring.

Areas of heavily impacted media will require special consideration in a RMP. These areas will often require risk reduction as part of the RMP and must be identified and managed as special units. While it is not possible to define the level of impact that would be critical to the definition of heavily impacted soil since this is dependent on-site conditions, information on identifying heavily impacted media is provided in this section and within this guide.

By definition, any media that has contaminant concentrations above a management limit in the Alberta Tier 1 guidelines is considered heavily impacted.

4.8.1 Source Removal and Control

A substance release that must be remediated, removed or managed is considered a contaminant source. Source removal and control prevents contamination from spreading to adjacent areas, and further exceedances of Alberta Tier 1 or Tier 2 guidelines. Where source removal is incomplete, the source and the CoPCs must be removed to the extent possible, and treatment, control and/or management measures implemented to address the residual source. Delineation must be sufficient to define the boundaries of the source and impacted area(s) on- and off-site. An estimate of the potential volume of contaminated media is required. Where source control is employed, an assessment of the source's mobility is required to support an argument for source control versus active remediation.

The source control plan needs to define the extent of the residual contamination. Delineation must be appropriate and adequately explained with sufficient detail to allow the Department or Regulator to independently understand and assess the extent of the residual source. The source control plan must specify how further contaminant migration into other areas will be prevented and how treatment measures will contribute to the ongoing reduction in contaminant concentrations at the source. A combination of source control and removal may be acceptable to the Department or Regulator.

The majority of RMPs with source control as part of the plan will require exposure control or technical solutions that require ongoing maintenance. The proponent must clearly identify how the site will be managed in the future to ensure that the source area will continue to be appropriately managed.

Source control measures must:

- Prevent the contaminant from spreading to adjacent areas;
- Operate until the source area meets Alberta Tier 1 or Tier 2 guidelines;
- Be supported by a monitoring program that demonstrates its efficacy;
- Identify any site management or site use restrictions to protect acute, sub-chronic and chronic risks to human and environmental health;
 - Including acute/sub-chronic effects as well as long-term/chronic effects;
- Include a contingency plan to be implemented if monitoring indicates adverse effects, such as, but not limited to, contaminant concentrations increasing or destabilizing; and
- For contaminant sources or plumes that have potential to migrate along the vapour or groundwater pathways, the requirement of a stable or decreasing plume must be included in any RMP.

Contingency plans must address how the proponent intends to assess and manage the source area in the event that the RMP does not meet intended goals (or fails), resulting in more serious consequences, such as

immediate risk of exposure to receptors. The groundwater and/or vapour monitoring program must be capable of quickly identifying changes in the source management program that will indicate increased risk.

4.8.2 Contaminant Concentrations above Management Limits

Management limits have been defined in the Alberta Tier 1 guidelines for hydrocarbon fractions F1 through F4. Management limits provide a simple tool for screening of heavily impacted media. Contaminant concentrations in media above management limits must be dealt with as heavily impacted media.

4.8.3 Evidence of Non Aqueous Phase Liquids

The site investigation must identify whether mobile LNAPL or DNAPL contaminants remain at the site. For DNAPL contamination, it is unlikely that there will be direct evidence of a DNAPL (free) phase due to the nature of that type contaminant and its migration. Therefore, other lines of evidence, including DNAPL concentrations in the dissolved phase, will need to be assessed for evidence of a DNAPL source below the water table. Care must be taken to assess vertical distribution for historical spills since DNAPL migration will be less predictable. The absence of high soil or groundwater concentrations does not automatically exclude the presence of a DNAPL source.

While it is expected that removal of non-aqueous phase liquids (NAPLs) is required prior to starting a RMP, there are circumstances involving residual or occluded phases or immobile free-phases where risk management is an option. However, these usually require special considerations for the RMP, such as vapour barriers, vapour monitoring, restricted development on source areas, and/or vapour or groundwater management plans.

Presence of NAPLs requires, in all instances, monitoring programs to demonstrate contaminant plume stability or decreasing contaminant plume size and additional planning regarding access to the source area.

4.8.4 Identification of Heavily Impacted Media

Heavily impacted media will require special consideration in the RMP. Heavily impacted media will include source areas (4.8.1), concentrations above management limits (4.8.2) and NAPL layers/pools (4.8.3). In addition, there are other examples of heavily impacted media that must receive special attention in developing the RMP. These include:

- CoPC concentrations that pose acute or sub-chronic human health or environmental risks if the RMP fails.
- Volatile or semi-volatile CoPC concentrations that are sufficiently high that exposure to the vapour phase may pose acute or sub-chronic, toxicity risks, direct risks to buried infrastructure, fire or explosive hazards or may prevent biological activity causing migration beyond the defined management area.
- Chemical concentrations in soil or groundwater sufficiently high that there could be chemical or physical alterations to the soil, sediment or to the physical controls employed to control exposure. Examples may include, but are not limited to, changes in physical structure caused by free-phase formation, redox changes, pH changes, soil acidification, and sodification.
- Dissolved phase concentrations that can alter physical or chemical properties of the groundwater or surrounding media. Examples include brines (e.g. salinity greater than 10,000 mg/L dissolved solids), highly saline media, etc.

For RMPs with heavily impacted media there will be increased requirements for the site management. This may include:

- Risk reduction through remediation or removal of the highest impacts.
- Requirements for special management areas where development or access is restricted.
- Special requirements for infrastructure.
- Specific management requirements or restrictions for excavation at the site or installation of utilities.
- Specific requirements for capping, soil stabilization or other management procedures to limit direct exposure to the soil and monitoring and soil handling procedures to prevent exposure.
- Requirements for active vapour or groundwater management to prevent contaminants from moving past a certain risk management area.
- Special administrative requirements that prevent access to certain areas or groundwater restrictions within a defined area or land use restrictions for certain control areas.
- Special management requirements to prevent flow to surface water receptors, shallow groundwater or other areas where exposure may be possible.
- Stakeholder communication plan including a plan to inform future stakeholders of any restrictions or requirements to manage the vapour inhalation pathway.

While the presence of heavily impacted media will not automatically exclude the ability to use exposure control as a risk management option at a site, the presence of heavily impacted media will automatically require increased attention to monitoring requirements and contingency plans. It will be more difficult to demonstrate plan viability since additional site management requirements will need to provide assurance that the RMP will continue to be implemented in the future. These types of strategies may require administrative

controls from municipalities to ensure that certain types of activities (e.g.: installation of utilities, site development, etc.) are not conducted within the management areas.

In all instances where the contaminant is mobile in the groundwater or vapour media, the presence of heavily impacted soil may identify a known source area and will require some form of source control, and restricted development in the area of highest impact. Sources of contamination can aggravate or otherwise worsen environmental quality by contributing to an increase in the extent and degree of contamination in the environment over time.

4.8.5 Preferential Flow Paths

If the contaminant has entered or has the potential to enter preferential flow paths the RMP must address the increased risk to the groundwater or vapour media along these exposure pathways. This includes, but is not limited to: fractured bedrock, fractured bedrock near surface for the vapour inhalation pathway, coarse-grained deposits, or coarse materials along utility rights-of-way for both vapour and groundwater pathways.

For the vapour pathway, fractured bedrock presents a concern when it is near surface and could act as a conduit for vapour migration to the foundation of a building. Similarly, coarse material along utility rights-of-way may become a concern if the contaminant is close to a building and the conduit can move vapours into the building.

For the groundwater pathway, the RMP must consider the potential for rapid migration in fractured bedrock or coarse-textured materials. Where contaminants are within a fluvial floodplain or utility right-of-way, a special consideration for the aquatic pathway may be required.

4.9 Soil Vapour Evaluation and Management – Volatile and Semi-Volatile Contaminants

The RMP must consider the vapour inhalation pathway for any CoPC that is considered volatile or semi-volatile.

For CoPCs with no Alberta Tier 1 guidelines, the proponent must determine whether a particular CoPC is considered volatile or semi-volatile and poses a risk via the human vapour-inhalation pathway. Refer to *A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours* (CCME, 2014) to determine whether the CoPC is volatile and poses a potential risk via the human vapour-inhalation pathway.

Where CoPCs have Alberta Tier 1 guidelines, the vapour inhalation guidelines can be used as a screening tool to determine whether a particular CoPC poses a risk in the vapour phase. For volatile and semi-volatile CoPCs, the RMP must include monitoring and evaluation of vapour concentrations near buildings, sub-slab, and/or within the building and near the vapour source. To ensure adequacy of the vapour monitoring and management program, see *Guidance for Environmental Site Characterization in Support of Human Health Risk Assessment* (Volumes 1-4; CCME, 2016d).

At a minimum, the following is required for the soil vapour monitoring program:

- Soil-vapour probes are located in the appropriate areas to monitor soil vapour concentrations near buildings and nearby source-vapour concentrations.
- Soil-vapour probes must be properly installed and tested prior to use.
- Proper QA/QC protocols are adhered to, to ensure that samples collected are representative of the vapour of contaminant(s) in the soil.
- Appropriate attenuation charts or protocols were used to estimate attenuation coefficients for calculating soil-vapour guidelines for the CoPCs. (See: *A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours* (CCME, 2014) for information on calculation of vapour attenuation coefficients.)
- The appropriate site-specific soil-vapour guidelines are adhered to for assessment of the contaminants of potential concern.

If a RMP is to include soil or groundwater with volatile and semi-volatile contaminants of concern, the proponent must consider how the vapour phase concerns are to be managed in the future. The applicant must include in the RMP the following:

- Restrictions required for surface receptors that might be present at the site. This could include:
 - Restricted access areas to prevent exposure
 - Restriction on future development
 - Requirements for any future infrastructure such as requirements for exposure barriers, vapour extraction systems, use of clean corridors for any buried infrastructure etc.
- Special considerations to be used when excavating or accessing the area due to potential for vapour exposure.
- Restrictions from buried infrastructure due to potential for damage to the materials.
- Requirements for more active venting or soil-vapour treatment processes.
- Stakeholder communication plan including a plan to inform future stakeholders of any restrictions or requirements that are necessary to manage the vapour inhalation pathway.

In most instances, it will be reasonable to assume that the risk-managed area for volatile or semi-volatile contaminants will include a defined area exceeding a risk-based soil-vapour concentration plus 30 m setback (AENV 2007a, as amended). This area could be defined based on an Alberta Tier 1 vapour guideline, an Alberta Tier 2 modified guideline or site-specific guidance based on direct soil-vapour measurements.

Some exceptions to this general rule that may require expanding the managed area may include:

- The potential for contaminant migration in the vapour phase along preferential flow paths that is beyond the risk-managed area. Preferential flow paths could include coarse materials along utility corridors or very coarse soil layers that allow for greater migration of soil vapour.
- The potential for migration of the volatile contaminant as either a free-phase liquid or dissolved phase in the groundwater. The potential to migrate in these phases beyond the risk-managed area needs to be included in the RMP.
- High concentrations in the soil that may pose risks to workers excavating the soil, workers that may be exposed through trenching or work on utility lines, integrity to buried infrastructure within the risk-managed area, direct fire or explosive hazards to nearby residences when exposed to release from an excavation.
- High concentrations of contaminants in the soil in ecologically-sensitive locations, and the possible impacts to rare or endangered species, where the area is considered critical habitat and the plant or animal species may live underground (e.g., burrowing owl habitat).

4.10 Observation of Adverse Effects

Any observed direct adverse effect(s) must be evaluated and managed, regardless of CoPC concentration. Observing new or additional adverse effects indicates assumptions within the RMP were incorrect and require the RMP to be re-evaluated or amended. Adverse effects shall initiate a re-evaluation of whether adverse effects are anticipated elsewhere, such as those based on CoPC concentrations, for example.

4.11 Acute, Sub-chronic, and Chronic Exposure

The calculations in Alberta Tier 1 guidelines assume chronic effects that may occur due to long-term exposure to contaminants.

Sources have the potential to be at concentrations that pose acute, sub-chronic, and/or chronic risks to human health or the environment. The proponent must clearly explore the possible risks associated with short-term exposure to sources and, if risks are identified, the proponent must identify how the RMP will prevent the short-term exposure of critical receptors. If a risk cannot be mitigated, the RMP will be rejected by the Department and/or Regulator, and the proponent must remediate the contamination.

For the direct contact, groundwater, and vapour pathways, particular attention must be given to cases where contaminant concentration is such that it may cause adverse effects for limited exposures. While effects are highly dependent on the contaminant and environmental properties, potential for short term impacts will need to be considered for any contaminant concentration that is more than 10 times the chronic exposure criterion for that pathway (Note: this is a generalized statement, as some CoPCs can create acute or sub-chronic effects even at less than 10x chronic exposure.).

4.12 Human Health Exposure via Direct Contact or Ingestion Pathways

The proponent must demonstrate whether there has been assessment of acute, sub-chronic, or chronic exposure risks.

Special consideration must be taken for contaminants that biomagnify or bioaccumulate in the food chain, such as those that can (bio)magnify or (bio)accumulate in plant or animal tissues. This is of concern for human health as well, since it increases risk of exposure through consumption of food products. Bioconcentration factors or bioaccumulation (biomagnification) factors are often provided by agencies (e.g.: Environment Canada) that estimate ecological risk to organisms. These can be used as screening tools to determine if risks may be present for the CoPCs.

These factors are especially important for RMPs that must consider exposure to individuals that are sensitive because of dietary habits, traditional land use, or where there is potential for contaminants to biomagnify and/or bioaccumulate through the food chain and cause additional exposure risks if not managed appropriately.

The RMP must define whether it is possible for a particularly sensitive receptor to be exposed to abnormally high concentrations of contaminants through multiple or single exposure events based on the diet. Communities (populations, groups) or individuals with high use of game, locally grown products, and/or traditional medicines would be considered potentially sensitive receptors if their exposures were not accounted for under the applicable land-use category.

Special receptors such as a “pica” child (pica is the persistent eating of substances such as soil which have no nutritional value, ASTDR 2001) require special consideration when evaluating acute exposures for the direct

soil contact pathway. This occurrence will not automatically prevent risk management, if heavily impacted materials can be stabilized and prevented from migrating out of the risk management area. However, the RMP will require additional monitoring and management measures to provide a higher level of assurance against future exposure.

4.13 Sufficient Concentration to Alter Physical or Chemical Properties

If contaminant concentration is sufficient to alter physical or chemical properties of the soil or groundwater, such potential changes applicants must be stated in the RMP. This is especially relevant to high concentrations of acids/bases, oxidants, soluble organic compounds, NAPLs or salts in sufficiently high concentrations to be considered brines. Contaminant concentrations that could alter or inhibit the properties of the surrounding medium, transport mechanisms, pH values, redox conditions, biological conditions, (bio)degradation, and/or partitioning of other CoPCs that are being assumed for preventing risk must be accounted for. Increased substance (CoPC) mobility or the presence of other by-products must be noted, and appropriate sampling and management are to be conducted.

5. Implementation Requirements

Section 5, *Implementation Requirements*, outlines basic minimum information needed to convey how administrative and technical aspects of the RMP are fulfilled and monitored, as well as how they are communicated during various stages of the RMP. Aspects of the RMP must include, but are not limited to, the development, fulfillment, tracking, and termination aspects of the RMP as it relates to assessment, remediation and monitoring.

Risk management plans must contain the following:

- exposure control type(s) and specific exposure controls that are required for the site, listed and described;
- rationale for selecting the required exposure controls; and
- actions required to implement the exposure controls and ensure that they remain effective over the lifetime (until Alberta Tier 1 and/or Tier 2 guidelines are met) of the RMP; and
- rationale for the recommended actions required to implement the exposure controls and ensure they remain effective;
- timelines for milestones or program endpoints (such as meeting Alberta Tier 1 and/or Tier 2 guidelines) to be achieved to allow for revisiting or changing the RMP.
- contingency plan(s) in the event that the RMP or portions thereof are ineffective, not achieved within scheduled milestones, or conditions worsen;
- reporting schedules;
- commitment letter signed by responsible party or proponent; and
- in the event of off-site contamination, no objection letters signed by affected third parties.

5.1 Summary of Requirements and Conditions

All RMPs submitted to the Department or Regulator must include a written summary that provides a clear and simple synopsis of the full RMP document. The summary must be presented in such a way that readers can rapidly become acquainted with the larger body of material contained within the RMP. The summary will contain a brief statement of the problem or proposal covered within the RMP. The summary will include background information, concise analysis and main conclusions, with clear emphasis on the main risk management requirements or conditions as well as any exposure controls needed for the RMP to be an effective tool as part of the site management process. The RMP must state, what, if any, limitations the RMP poses to the use of the affected land(s). The executive summary is intended as an aid to professionals, decision-makers, site managers, and reviewers; yet, must be easily understood by any reader, proponent or affected party.

5.2 Risk Evaluation

All risks from APECs must be considered in the scope of the RMP. The RMP must clearly outline the specific exposure controls required to mitigate risk for each exposure pathway, contaminant or receptor with potential risk. Supporting rationale is required. The RMP must provide clear and unambiguous conclusions that all risks to receptors are being managed. If risks to receptors are not mitigated or managed, the RMP will not be accepted by the Department and/or Regulator.

Risk management plans must show prevention of further deterioration to soil and/or groundwater conditions. Further deterioration to soil and/or groundwater conditions may include, but are not limited to, increasing contaminant concentrations in soil and/or groundwater; contaminant plume expansion; impacts to other receptors not originally anticipated in the RMP; indirect impacts from the CoPCs such as changes to chemical or biological properties or creation of daughter products that can result from the substance release.

Where the failure of the RMP can result in more serious risks, a remediation program will be required to address immediate risk and a timeline for implementing the same.

Some examples of possible serious risks if the RMP fails include, but are not limited to:

- Acute or sub-chronic exposure to human receptors.
- Acute or sub-chronic exposure to ecological receptors.
- Sudden discharge of contaminants to aquatic environments.
- Risk of contaminants spreading to soil, sediment, air, surface water or groundwater at concentrations that exceed the appropriate guidelines for the medium.
- Loss of use or significant use restriction(s) for the site or impacted off-site area(s).

5.3 Monitoring Plan

Risk management plans must outline and establish an ongoing monitoring plan to continually ensure the effectiveness of the RMP. The monitoring plan with specified monitoring activities is needed to verify whether exposure control measures at a site are effective and on track, with a schedule for verification activities or monitoring requirements. Details to include, but are not limited to:

- a monitoring plan and specified monitoring activities to verify whether the exposure control measures at the site are effective;
- specific CoPCs being monitored;

- monitoring frequency and time of year;
- a schedule for verification activities or monitoring requirements included at the site; and
- a list of the person(s) or organization(s) responsible for maintaining records (e.g., the responsible person) and specific requirements for making records available to the Department or the Regulator.

Relevance of the information and the amount of detail required for these activities will be increased by the following factors:

- the RMP requires one or more active engineering controls or administrative controls. Plans with more active controls will require more detail than plans that are based on passive engineering controls or administrative controls; and
- where failure of the RMP may result in such conditions as immediate risk of exposure to humans or ecological receptors, sudden discharge to aquatic environments or other media.

The monitoring plan must examine changes to on-site and off-site conditions that may result from transport of the contaminant in the vapour, surface water or groundwater media. Monitoring must continually demonstrate that conditions are stable or improving. Risk management plans will not be accepted for a site that lacks information or does not show contaminant plume stability, decreasing contaminant concentration, or ongoing protection of identified receptors. If monitoring demonstrates that contaminant migration or deteriorating conditions are occurring, a contingency plan will need to be implemented.

The environmental professional must develop a sampling program that is acceptable to the Department or the Regulator.

The groundwater monitoring and sampling program must include a network of monitoring wells (delineation and sentinel wells) within the source area and contaminant plume, and at the point of compliance that are representative of the site. The program must identify:

- The monitoring wells and contaminants or parameters that will be sampled and analyzed;
- Field measurements that will be obtained including, but not limited to, groundwater depth or elevation, presence or absence of NAPL, and field vapour measurements, hydraulic conductivity; and
- Frequency of monitoring.

Once contaminant plume stability or sufficient contaminant mass reduction is demonstrated, the proponent may submit a proposal to the Department and/or Regulator to reduce the sampling frequency and/or number of samples. The Department and/or Regulator will not accept proposals to reduce monitoring and/or sampling efforts until plume stability and/or sufficient contaminant mass reduction can be demonstrated. Evaluation of reductions to monitoring intensity is based on the results and factors for each individual case.

Monitoring records for RMP performance and results must be kept and maintained by a responsible person or proponent, and be submitted to the Department or Regulator.

Records of RMP performance and results include items such as:

- inspections;
- monitoring of media to confirm efficacy;
- maintenance activities, including repairs;
- construction activities;
- soil management records;
- maintenance related to barriers, signage, etc.;
- registration of a covenant or legal instrument;
- notice of zoning restrictions; and
- any other exposure control activities that may be required related to the specified plan

5.4 Contingency Plan

A contingency plan must include triggers that initiate additional monitoring, alternative remedial or other risk management measures, and must be communicated and accepted by all stakeholders. All RMPs must have a contingency plan in place to be considered complete. Triggers and a response to what happens if those triggers are initiated must be clearly identified. The contingency plan must address the site complexity, and which exposure pathways are being managed.

The contingency plan can include many activities that can be implemented to address a variety of unexpected situations. This enables the use of contingent activities, if necessary, that in some situations may need to be applied immediately until the original RMP can be re-evaluated or an alternate remediation plan developed.

Immediate notification to the Department or Regulator via the 24-hour Energy & Environmental Response Line, at 1-800-222-6514 is required if and when an exposure control measure becomes compromised or no longer is effective, or if a contingency plan must be activated.

The contingency plan must also outline what measures will be undertaken and who will be contacted, should contaminated media subject to the RMP is disturbed or excavated, or if the engineered control features need to be maintained, repaired or replaced. Furthermore, an administrative control must identify known areas of

contaminated media, such as soil and/or groundwater, that are left in place and that require a specific management plan if disturbed by subsurface work or redevelopment in the future.

The contingency plan shall also include provisions to initiate renewed consultation for any affected or potentially affected party. This may depend on various factors such as the parties that are involved, or on-site versus off-site contamination.

5.5 Timelines and Plan Requirements

All RMPs must include timelines and milestones as well as monitoring and reporting schedules to ensure the effectiveness of the RMP. Content may be limited, with simple administrative plans but this information is still required.

The RMP must also include commitment from the current owner/operator as it relates to any long-term management, monitoring, and exposure barriers for the duration of the RMP. Timelines, milestones, and monitoring schedules must consider objectives, such as time needed to complete remediation to meet Alberta Tier 1 and/or 2 guidelines, and conducting or completing tasks and plans needed to meet remediation and regulatory closure guidelines.

The contingency plan, as part of the RMP, is used to address timelines of related project phases and consider their effectiveness in meeting Alberta Tier 1 and/or Tier 2 guidelines through ongoing evaluation and monitoring related to meeting project or RMP milestones.

5.6 Communication Plan

Implementation of a RMP requires the notification of all affected third parties and completion of an *Affected Third Party - Risk Management Plan No Objection* letter and/or an *Affected Third Party - Risk Management Plan Notification* letter. Further information regarding requirements for affected third parties is contained in the Alberta *Contaminated Sites Policy Framework* (ESRD, 2014a, as amended) and the *Alberta Exposure Control Guide* (AEP 2016b, as amended).

All affected third parties must be made aware when contaminants have migrated onto their property. The Department and/or Regulator expect that *Affected Third Party - Risk Management Plan Notification* letters will be sent to affected parties and that such letters will be included as an appendix in the RMP. The Department and/or Regulator require proof of notification to third parties. In addition to adjacent landowners

or tenants, third parties could include affected utility owners, the jurisdiction (hamlet, town, city, or county) in which the contaminated site is located, and the Government of Alberta, if required.

As part of the RMP's Monitoring and Contingency Plans, notification to affected third parties must be conducted if exposure controls are not performing as expected or if they have been compromised. Affected parties are to be provided reports and information related to their property by the proponent. While liability waivers and restrictions may be necessary in technical reports so they are not used out of context, any RMP that is accompanied by liability limitations, restrictions, or waiver clauses that limit or exclude the ability of the Department and/or Regulator or affected third parties to rely on the RMP will be automatically rejected.

Reporting must be used to verify and communicate performance and progress of RMP actions or to indicate that exposure controls are not functioning effectively, if contaminant releases occur, or if monitoring indicates exceedances of established guidelines.

Reporting of future land owners includes a range of options. A basic notification mechanism shall involve submission of the RMP and related reports (e.g., monitoring reports) to the Department or the Regulator without claims of confidentiality. Such submission will ensure that the records are publicly available under the Routine Disclosure legislation and accessible online via the Environmental Site Assessment Repository (ESAR) internet portal. For more complex plans, more formal notification mechanisms may be required.

If the RMP places any restrictions on the use of a property, requires monitoring on the third party property, or any physical or administrative requirements are required on the third party property in order to maintain the RMP, the Department or Regulator will require information on notification and concerns raised by any affected third parties attached as an appendix for the RMP. See the *Alberta Exposure Control Guide* (2016b) for more information on requirements for notification and consultation with third parties as part of the RMP. An example of an *Affected Third Party - Risk Management Plan No Objection* letter is attached in Appendix C.

If a site has been previously remediated or is currently being risk managed under a plan accepted by the Department and/or Regulator and the interested party would like a change of zoning to a more stringent land use, the person making the change may be required to conduct additional assessment and remediate to meet the guidelines for the more stringent land use.

5.7 Obligations for Long-term Care and Control

Any portion of a substance release and/or contaminated site under a RMP remains the responsibility of the person(s) responsible for the release or in other cases the proponent. When an ongoing RMP is proposed at a site, there must be a commitment by the person(s) responsible to maintain and monitor the RMP until Alberta Tier 1 or Tier 2 guidelines have been met. The person(s) responsible are also obligated to implement and maintain communications with affected parties and the Department and/or Regulator.

The owner and operator must commit to ongoing maintenance and monitoring measures included in the RMP indefinitely or until compliance with guidelines has been demonstrated. The Department and/or Regulator will not accept a RMP proposal that does not include a signed copy of the *Person(s) Responsible - Risk Management Plan Commitment* letter (Appendix B).

If at any time the source land is to be transferred or sold, the party responsible for implementing the RMP must provide full disclosure of the state of the property by providing the interested parties with a copy of the above accepted RMP and any related information required.

Liability waivers and restrictions are often a necessary part of technical reports so information is not used out of context or for purposes not intended, such as reliance on the report by an unknown or unintended third party. However, any RMP that is accompanied by liability limitations, restrictions, or waiver clauses that limit or exclude the ability of the Department and/or Regulator or affected third parties to rely on the RMP will be automatically rejected.

Original signed by: Kem Singh, Executive Director.

Date: October 19, 2017

Land Policy Branch
Environment and Parks

6. References

- Alberta Environment (AENV), 1994. Subsurface Remediation Guidelines for Petroleum Storage Tank Sites.
- Alberta Environment (AENV), 2001a. Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities.
- Alberta Environment (AENV), 2001b. Risk Management Guidelines for Petroleum Storage Tank Sites.
- Alberta Environment (AENV), 2001c. Salt Contamination, Assessment and Remediation Guidelines.
- Alberta Environment (AENV), 2006. Competencies for Remediation and Reclamation Advisory Committee: Recommendations Report.
- Alberta Environment (AENV), 2007a, as amended. Alberta Tier 1 Soil and Groundwater Remediation Guidelines.
- Alberta Environment (AENV), 2007b, as amended. Alberta Tier 2 Soil and Groundwater Remediation Guidelines.
- Alberta Environment (AENV), 2009. Record of Site Condition Form.
- Alberta Environment and Parks (AEP), 2016a. Alberta Environmental Site Assessment Standard.
- Alberta Environment and Parks (AEP), 2016b. Alberta Exposure Control Guide.
- Alberta Environment and Parks (AEP), 2016c. Reporting Spills and Releases.
- Alberta Environment and Sustainable Resource Development (ESRD), 2014a. Contaminated Sites Policy Framework.
- Alberta Environment and Sustainable Resource Development (ESRD), 2014b. Environmental Guidelines for Alberta Surface Waters. Water Policy Branch, Policy Division. Edmonton. 48 pp.
- Alberta Environment and Water and Alberta Labour, 1991. Management of Underground Storage Tanks (MUST) Project. Subsurface Remediation Guidelines for Underground Storage Tanks. Feb. 1991.
- Agency for Toxic Substances & Disease Registry (ATSDR), 2001. Summary Report for the ATSDR Soil – Pica Workshop, June 7-8, 2000, Atlanta, Georgia, US Department of Health and Human Services.
- Canadian Council of Ministers of the Environment (CCME), 1996. Guidance Manual on Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites in Canada. Canadian Council for the Ministers of the Environment National Contaminated Sites Remediation Program, March 1996.
- Canadian Council of Ministers of the Environment (CCME), 1997. Guidance Manual on the Management of Contaminated Sites in Canada. Canadian Council of Ministers of the Environment, April, 1997.
- Canadian Council of Ministers of the Environment (CCME), 2006. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. Canadian Council of Ministers of the Environment, 2006.
- Canadian Council of Ministers of the Environment (CCME), 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours, 2014.
- Canadian Council of Ministers of the Environment (CCME), 2016. Guidance Manual for Environmental Site Characterization in Support of Human Health Risk Assessment, Volumes 1-4.

Appendix A – Review Checklist for Risk Management Plans

This checklist was designed to be used in conjunction with guidance provided in the *Risk Management Plan Guide*.

The Risk Management Plan (RMP) Checklist is intended as a companion document to the Guide and must not be used as a substitute or on its own.

The review checklist must be reviewed, completed and submitted by the environmental professional as an Appendix to the RMP.

Administrative Requirements

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
3.1 Completed Reviewer's Checklist	Was a completed reviewer's checklist submitted by the professional in an appendix to the RMP?			
3.2 Site Identification and Physical Location	Is the legal address of the source site provided (Plan, Block, Lot and/or Legal Land Description)?			
	If it is a municipal site, is the civic/street address of the source site provided?			
	Are legal and/or municipal street addresses of all affected adjacent lands provided?			
	Is the site name provided?			
	Is the relevant file information provided? (e.g., AEP/AER CSU, PST or SCD file number, Approval number, Incident or Reference number.)			
3.3 Proponent Information	Is the name, address and other business card information of the registered owner or person(s) responsible, occupant, renter and lessee provided?			

3.4 Consultant Information	Is the key contact information provided? (Name, address and other relevant business card information)?			
	Did the consultant(s) who prepared the RMP provide verification of appropriate professional status (e.g., stamp, permit to practice, number demonstrating professional designation)?			
3.5 Record of Site Condition	Has a signed Record of Site Condition (RSC) form been submitted with Section 7 completed?			
3.6 Outstanding Legal Requirements	Are there any federal, provincial, or municipal requirements, charges, or orders that may be attached to the site that need to be considered in developing the RMP?			

Site Investigation Requirements

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
4.1 Background Site Information	Does the RMP provide background site information?			
	Are there references to all background reports detailing site history?			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
	<p>Does the background summary provide or reference detailed scale site maps including;</p> <ul style="list-style-type: none"> • the location of previous, current and proposed buildings, • current operating status of the site, • any impacted offsite properties, • historic, current, future site and adjacent land uses, • soil type(s) and fill material type(s), • surface drainage directions, • depth to groundwater and groundwater flow direction, • natural features, including any permanent or seasonal surface water bodies to at least 300 m from the contaminant plume, • any existing well locations within 300 m of the APECs (or 100 m up-gradient and 300 m down-gradient if sufficient groundwater information is available), • all previous and current soil and groundwater monitoring locations, • surface and underground structures including utility services, • soil and groundwater sampling, delineation and remediation results • two-dimensional representation of all areas of potential concern, including relative concentrations of CoPCs, and • sufficient information to understand vertical distribution of the CoPCs? 			
	<p>Where multiple risk management areas are proposed, are there vertical and horizontal representations of the various risk management areas?</p>			
	<p>Does the site summary provide sufficient information to understand risks to sensitive receptors if present?</p>			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
	Where multiple land uses or development restrictions are considered over the area, is it clear what land uses are applicable to which area(s)?			
4.2 Conceptual Site Model (CSM)	Is a CSM provided?			
	Does the report summarize the CSM in a manner that it provides clear and unambiguous information regarding critical pathways and receptors?			
	Were any assumptions, calculations, statistical analyses and/or tables used? Was a worked example of any calculations or sufficient explanation of statistical analyses provided?			
4.3 Contaminants of Potential Concern (CoPCs)	Does the RMP information clearly identify the CoPCs?			
4.4 Risks Associated with Site Condition	Are there clear and unambiguous conclusions supported with technical information regarding risks associated with the current site condition?			
4.5 Land Use and Zoning	Where applicable, have any future land uses or potential changes to zoning been verified with the municipality in question?			
	Is surrounding land use provided (where applicable)?			
	Does land use zoning(s) described in the report conform to the Alberta Tier 1 land use descriptions?			
	If land use zoning(s) do not conform to the Alberta Tier 1 land use descriptions, has the consultant taken into account appropriate special considerations to account for differences in land use between the Alberta Tier 1 description and that described in the report?			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
4.6 Remediation Guideline Selection	Does the RMP state which remediation guidelines are being used and why? What receptors and pathways have been identified for this site?			
	Is it clear which remediation guidelines are being applied to which areas?			
	Have the relevant Alberta Tier 1 guidelines been documented and compared against the site condition in this or previous reports?			
	Where an Alberta Tier 2 option has been employed for any CoPC, has sufficient justification for the Alberta Tier 2 option been documented in this or previous reports?			
	Where an Alberta Tier 2 site-specific risk assessment process has been used for any CoPCs, has this been reviewed?			
	Have the conclusions of the risk assessment been accepted by the Department and/or Regulator?			
	For sites where there is a more sensitive land use adjacent to the site, has the 30 m buffer zone been applied for contaminants that may be laterally mobile in the groundwater or vapour media?			
4.7 Complete Delineation	Is delineation of contamination in soil complete vertically and horizontally? Where contamination has entered the bedrock, delineation must be complete for bedrock as well.			
	Where impact to the groundwater has not been ruled out, is delineation of contamination in groundwater both vertically and horizontally complete?			
4.8 Evaluation and Management of Source and Heavily Impacted Media	For soil or groundwater contamination, have all sources of contamination, as defined in Alberta Tier 1 guidelines been identified, removed and properly disposed of or remediated and/or controlled as per Alberta Tier 2, Section 2.3.1?			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
	Where a source area is being managed rather than remediated, is delineation sufficient to define the boundaries of the source areas or heavily impacted soils and to estimate potential mass and volume of contamination? It is important to understand the highest concentration and spatial distribution of the source and plume.			
4.8.1 Source Removal and Control	Is there a timeline for source removal and source control? Does it seem feasible?			
	If source control is proposed, does information provide detail that the control measure will: <ul style="list-style-type: none"> • prevent the contaminant from spreading to adjacent areas (i.e. offsite) causing the soil or groundwater to exceed Alberta Tier 1 or Tier 2 guidelines?, • operate until the source area meets remediation guidelines?, • be supported by a monitoring program that demonstrates its efficacy?, • identify any site management or use restrictions to protect acute, sub-chronic and chronic risks to human and environmental health?, and • include a contingency plan to be implemented if monitoring indicates unacceptable risks? 			
4.8.2 Contaminant Concentrations above Management Limits	Are contaminant concentrations above applicable management limits?			
	Are there any areas of active risk management or technical solutions that require ongoing maintenance, such as source control plans (or other)?			
	Will the site be managed in the future to ensure that the source area will continue to be appropriately managed?			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
	For any source(s) of contamination in the soil or groundwater, are there sufficient lines of evidence provided in the RMP to demonstrate that the risks associated with the contaminated area will remain stable or will decrease with time and ensure against further contaminant migration to any area outside the managed area?			
4.8.3 Evidence of Non-Aqueous Phase Liquids (NAPLs)	Does investigation provide enough information to demonstrate that NAPL is absent?			
	Are DNAPLs and/or LNAPLs described?			
	If free-phase NAPL remains, is information related to mobility, volatility (potential to migrate to a human receptor at ground surface), solubility (potential to enter the groundwater pathway) and toxicity included?			
	Is a monitoring program proposed to demonstrate contaminant plume stability or decreasing contaminant plume size?			
	Has the proponent identified special considerations (e.g. vapour barriers, vapour monitoring, restricted development, etc.) for NAPLs/source areas?			
	Has the proponent identified how access to the source area will be attained in the event that it is required in the future, including any hindrances to access from infrastructure or development?			
4.8.4 Identification of Heavily Impacted Media	Has the proponent indicated the presence of heavily impacted media in the RMP proposal?			
	Are administrative controls required to ensure activities are not conducted within the management areas?			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
4.8.5 Preferential Flow Paths	If the CoPC has entered or has potential to enter preferential flow paths such as fractured bedrock, deposits comprised dominantly of medium, coarse sands and/or gravel, or coarse-grained materials along utility rights-of-way, has the RMP addressed increased risk to the groundwater or vapour phases along these exposure routes?			
	Is modeling being used to address the layers encountered and flow movement among layers? If modelling has been used, has sufficient information explaining the modelling been provided?			
4.9 Soil Vapour Evaluation and Management	For volatile or semi-volatile CoPCs, has the applicant included an evaluation of the potential for contaminant migration in the vapour phase beyond the risk managed area or along preferential flow paths?			
	For volatile or semi-volatile CoPCs, has the applicant appropriately considered restrictions required for surface receptors, future development, buried infrastructure, fire, explosive hazards and potential for exposures during excavation?			
	For volatile CoPCs, does the RMP ensure monitoring of vapour concentrations near buildings, within the building and near the source of vapours?			
	If necessary, are the soil vapour probes located in the appropriate areas to monitor the near building and/or near source vapour concentrations?			
	If necessary, have the soil vapour probes been properly installed and tested prior to use?			
	Has the applicant used proper QA/QC protocols to ensure that samples collected are representative of the vapour in the soil?			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
	Has the applicant used appropriate attenuation charts or protocols to estimate attenuation coefficients to calculate soil vapour guidelines for the CoPCs? Has the applicant provided sufficient information on how the attenuations were derived?			
	Have the appropriate site-specific soil vapour guidelines been used in the assessment of the contaminants?			
4.10 Observation of Adverse Effects	Were adverse effects observed?			
	Was the RMP re-evaluated and/or amended after adverse effects were observed?			
	Can further adverse effects be anticipated for the RMP?			
4.11 Acute, Sub-chronic, or Chronic Exposure	Are there acute, sub-chronic, or chronic exposure concerns that need to be considered?			
	If so, does the RMP indicate how short term exposure of critical receptors will be prevented?			
4.12 Human Health Exposure via Direct Contact or Ingestion Pathways	Is there the potential for exposure of a sensitive receptor to high levels of CoPCs through multiple or single exposure events based on direct contact or ingestion pathways (e.g. pica child exposure, populations with high reliance on game or locally grown food products)?			
	For human health direct contact or ingestion pathways, has the applicant considered risks from potential acute, short-term, sub-chronic, or chronic effects within the risk managed area (e.g. effects to the “pica” child or other high exposure incidents that may result in acute, short-term, sub-chronic, or chronic health effects, concentrations that may cause acute, short-term, sub-chronic, or chronic health effects in general populations)?			

Section of Guide	Query	Yes, No, N/A	Page # in report	Comments, Discussion, Description
	Has the applicant appropriately considered risks of surface exposure for human health direct contact or ingestion exposure pathways, within heavily impacted areas and proposed acceptable methods to prevent or mitigate exposure via this route?			
4.14 Sufficient Concentrations to alter Physical or Chemical Properties	Is the CoPC concentration sufficient to alter the physical or chemical properties of the soil or groundwater? If so, outline special considerations to address potential changes in the surrounding medium, transport mechanisms, pH value, redox conditions, or biological conditions.			

Implementation Requirements

Section of Guide	Query	Yes, No, N/A.	Page # in report	Comments, Discussion, Description
5.1 Summary of Requirements and Conditions	Is a written summary (executive summary or management summary) of requirements and/or conditions for the RMP provided?			
	Is the summary clear, concise, and simple? Is information presented in such a way that all readers can rapidly become acquainted with the larger body of material contained within the RMP?			
	Does the summary contain a brief statement of the problem or proposal covered within the RMP? Are background information, a concise analysis of the problem and main conclusions presented?			
	Is there clear emphasis on the main risk management requirements, conditions, and exposure controls needed for the RMP to be effective?			
5.2 Risk Evaluation	Have all risks from APECs or CoPCs been considered in the scope of the RMP?			
	Does the RMP have clear and unambiguous conclusions that demonstrate protection of receptors that may be at risk during the life of the RMP?			

Section of Guide	Query	Yes, No, N/A.	Page # in report	Comments, Discussion, Description
	<p>Is the RMP supporting rationale sufficient to demonstrate that it will protect human health and environment?</p> <p>Would failure of the RMP result in any of the following:</p> <ul style="list-style-type: none"> • Immediate risk of exposure of humans to CoPCs at levels likely to be above Alberta Tier 1 or Tier 2 guidelines for a pathway of concern? • Sudden discharge of CoPCs to aquatic environments? • Immediate risk to terrestrial or non-human receptors? • Risk of CoPCs spreading to media such as soil, sediment, air, surface water or groundwater at concentrations that exceed the regulatory guidelines? <p>Where the failure of the RMP can result in more serious risks, such as immediate risks of exposure to humans or discharge into aquatic environments, more detailed monitoring, management and contingency plans will need to be included.</p>			
	Does the RMP provide sufficient details on the exposure barriers to be used?			
	Will the RMP prevent further deterioration of soil or groundwater conditions?			
	Does the RMP ensure appropriate management of CoPCs if disturbed or excavated in the future?			
5.3 Monitoring Plan	Does the RMP have a Monitoring Plan?			
	For mobile CoPCs, does the RMP monitor changes to on-site and off-site conditions that may result from transport of the CoPC in the vapour or groundwater media?			

Section of Guide	Query	Yes, No, N/A.	Page # in report	Comments, Discussion, Description
	Does the RMP include clearly defined monitoring requirements including reporting schedules to Alberta Environment and Parks and/or Alberta Energy Regulator and any affected stakeholders?			
5.4 Contingency Plan	Does the RMP have a Contingency Plan?			
	Does the RMP include measures to identify changes to site condition?			
	Does the RMP include clear triggers to identify whether risks associated with the managed area are not stable or decreasing with time?			
	Does the contingency plan include provisions to initiate renewed stakeholder consultations for any affected or potentially affected party?			
5.5 Timelines and Plan Requirements	Does the RMP include timelines, milestones, and/or monitoring to ensure that the effectiveness of the RMP is determined?			
	Is there a clear understanding of the time frame that will be required and does the RMP include commitments by appropriate parties for any long-term management or monitoring?			
5.6 Communication Plan	Does the RMP have a Communication Plan?			

Section of Guide	Query	Yes, No, N/A.	Page # in report	Comments, Discussion, Description
	Have all directly impacted landowners provided a signed copy of the <i>Affected Third Party – Risk Management Plan No Objection</i> form? These parties may include affected adjacent landowners, the municipality in which the contaminated site resides and potentially the Government of Alberta, if required.			
	Have <i>Affected Third Party – Risk Management Plan Notification</i> letters been sent to affected parties and are the letters included as an appendix in the RMP?			
	Does the communication plan ensure that all affected parties are aware of any restrictions on use required by the RMP?			
	Does the communication plan ensure that current and future land owners and other affected parties will be notified of any physical or administrative requirements to maintain the RMP?			
	Does the RMP include a mechanism for affected third parties, the proponent and the consultant to discuss and resolve third party concerns?			
	Does the RMP document concern(s) raised from third parties and methods used to address those concerns?			
5.7 Obligations for Long-term Care and Control	Does the RMP need long-term care and control to perform successfully?			
	Has the applicant submitted a signed copy of the <i>Person(s) Responsible – Risk Management Plan Commitment</i> form that indicates maintaining the RMP indefinitely or until compliance with the governing risk management objectives have been demonstrated?			
	For any RMP that requires ongoing administrative commitments to ensure against exposure along a particular pathway, have administrative commitments been made to ensure the requirement is communicated and enacted for the time required?			

Appendix B – Person(s) Responsible - Risk Management Plan Commitment (SAMPLE)

Department File Number: _____

1. I, _____, am the person responsible/owner/operator (the “Person(s) Responsible”) of a contaminated site on lands (the “Source Lands” or “Source Land”) legally described as: _____.
I am submitting a Risk Management Plan (RMP) proposal, expressed as “_____”, prepared by _____, dated _____, to Alberta Environment and Parks. I Declare that, as the Person(s) Responsible, I have read and fully understand the proposed RMP and am committed to any and all requirements necessary to fulfill and maintain the RMP as described until such time all Lands contaminated by and including my own have been remediated to the appropriate regulatory guidelines of the day.

2. I have, to the best of my abilities, identified all lands that are, or that may become, affected by the contamination emanating from my Source Land(s). I have completed a Declaration in respect of each such legal parcel of affected or potentially affected lands.

3. This Declaration is made in respect of the lands which are affected, or that may become affected by the contamination, and which are legally described as and have as a registered owner(s) the following person(s) [include legal description of Land(s), registered owner name(s) and contact telephone number(s)]:

(List all Source Land(s))

(List all Affected Land(s))

(List all Affected Land(s))

(the “Registered Owner(s)”).

4. In the case of risk management, I have provided the Registered Owner(s) with a copy of the proposed Risk Management Plan for contamination on the Source Land(s). The Registered Owner(s) (or authorized representative of the Registered Owners if there is more than one) has/have indicated no objection to the Risk Management option and of the Risk Management Plan proposal which has been provided to them, and they have signed an *Affected Third Party – Risk Management Plan No Objection* form.

5. I have entered into Risk Management in respect of the affected Lands with the Registered Owner(s). If, at any time, the Risk Management Plan is modified significantly, I will provide the Registered Owner(s) with any information required to ensure their understanding and ongoing commitment.

6. If at any time my Land is to be transferred or sold, I will give full disclosure of the state of the property by providing the interested parties with a copy of the above described RMP and any related information required. If a land transaction occurs, and the purchaser is committed to taking over responsibility and liability for the contamination and the RMP, I will provide them with a copy of the *Person(s) Responsible - Risk Management Plan Commitment* form, have them sign and personally return a copy to Alberta Environment and Parks and/or Alberta Energy Regulator for their records. If I am to maintain responsibility and liability for the RMP, I will report to Alberta Environment and Parks and/or Alberta Energy Regulator that the property has been sold (including purchaser name, address and telephone number) but indicate that I remain the Person Responsible for contamination and the RMP.

Signature: _____ Date: _____
(Sworn before a commissioner of oaths)

The Risk Management Plan must technically demonstrate an equivalent level of human and ecological health protection as *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* or *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*. All affected third parties must agree to the terms and conditions of the Risk Management Plan. The person(s) responsible must obtain no objection to the terms and conditions of the ongoing Risk Management Plan from all affected third parties. Any portion of the release under a Risk Management Plan remains the responsibility of the person(s) responsible for the release under the *Environmental Protection and Enhancement Act*.

The Risk Management Plan proposal must include the signed *Person(s) Responsible - Risk Management Plan Commitment* form as well as any *Affected Third Party - Risk Management Plan No Objection* form(s) and *Affected Third Party - Risk Management Plan Notification* letter(s).

Appendix C – Affected Third Party - Risk Management Plan No Objection (SAMPLE)

Department File Number: _____

1. I, _____, am:
 - a. the registered owner of the lands legally described as _____ (the “Lands”). **OR**
 - b. one of the following registered owners, including _____, _____, _____ and _____ (use the back of this Acknowledgement if additional space is required) of the lands legally described as _____ (the “Lands”), and have been authorized to sign this Non-Objection on behalf of all of the Registered Owners of the Lands.
2. I am aware that _____ (“Person(s) Responsible”) is submitting a Risk Management Plan proposal with respect to contamination emanating from their Source Land(s) legally described as: _____.
3. I am aware that the contamination on the above noted land is either causing or may cause adverse effects on the Lands of which I am the/a Registered Owner.
4. I acknowledge that I have reviewed and do not object to the Risk Management Plan proposed by the Person(s) Responsible. I understand that by not objecting to the Risk Management Plan proposed, that if, at any time, my Land is to be transferred or sold, I will give full disclosure of the state of the property by providing the interested parties with a copy of the above described RMP and any related information required.
5. By signing below, I understand that I do not object to entering into a Risk Management Plan with the Person(s) Responsible.

Dated this _____ day of _____ (month), _____ (year).

(Registered Owner)

of _____ (Mailing Address) Phone: _____

Witness Name: _____ Signature: _____
(Sworn before a commissioner of oaths)

Alberta Environment and Parks is collecting this information to assess the Person(s) Responsible Risk Management Plan proposal in respect of specific contamination on and emanating from their land. The information in this document is deemed to be public information for the purposes of s. 35 of EPEA and the Disclosure of Information Regulation (AR 273/2004).

A Risk Management Plan is required for areas that have not been remediated and contamination remains in concentrations greater than the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* or *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*. The Risk Management Plan measures must be designed and implemented to demonstrate an equivalent level of human and ecological health protection. Elements of a Risk Management Plan include, but are not limited to, the following: protection of receptors, demonstration that any potential risks are being managed, administrative and exposure barriers, land use restrictions, monitoring, a communication plan if needed, and affected third party non-objection and commitment from persons responsible.

The Risk Management Plan proposal must include the signed *Person(s) Responsible - Risk Management Plan Commitment* form as well as any *Affected Third Party - Risk Management Plan No Objection* form(s) and *Affected Third Party - Risk Management Plan Notification* letter(s).

Appendix D – Affected Third Party - Risk Management Plan Notification (SAMPLE)

This letter template is to be used to report to affected third parties. In some cases, the Director may accept reporting in lieu of a third party Letter of No Objection, if no response is forthcoming. For more information, see the 'Alberta Contaminated Sites Policy Framework' (2014a) and the 'Alberta Exposure Control Guide' (2016b).

Date

Department File #:
Consultant Project #:

Contact Name
c/o Company Name
Mailing Address
Town, Province Postal Code

Dear Contact Name,

**RE: Risk Management Plan Proposal
Person(s) Responsible Lands Location and Location of Other Affected Adjacent Lands**

Alberta Environment and Parks and/or Alberta Energy Regulator mandates that all third parties potentially affected by contamination on or emanating from the above noted lands be notified of a Risk Management Plan proposal. I have attached a copy of the Risk Management Plan proposal for your review and future reference.

In the event that surface/subsurface contamination in off-site areas is disturbed while the Risk Management Plan is in effect, please be advised that you are to inform the Person(s) Responsible identified in the proposal. If impacted soil or groundwater is discovered, an appropriate risk management or remediation plan, acceptable to Alberta Environment and Parks and/or Alberta Energy Regulator, will be implemented by the Person(s) Responsible at that time to protect human health and ecological receptors.

If you have any questions or concerns pertaining to this matter please indicate in writing at your earliest convenience.

Sincerely,

Consultant or Person(s) Responsible
Title/Role

cc: Consultant or Person(s) Responsible

Alberta Environment and Parks is collecting this information to assess the Person(s) Responsible Risk Management Plan proposal in respect of specific contamination on and emanating from their land. The information in this document is deemed to be public information for the purposes of s. 35 of EPEA and the Disclosure of Information Regulation (AR 273/2004).

A Risk Management Plan is required for areas that have not been remediated and contamination remains in concentrations greater than the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* or *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*. The Risk Management Plan measures must be designed and implemented to demonstrate an equivalent level of human and ecological health protection. Elements of a Risk Management Plan include, but are not limited to, the following: protection of receptors, demonstration that any potential risks are being managed, administrative and exposure controls, land use restrictions, monitoring, affected third party non-objection and commitment from persons responsible.

The Risk Management Plan proposal must include the signed *Person(s) Responsible – Risk Management Plan Commitment* form as well as any *Affected Third Party – Risk Management Plan No Objection* form(s) and *Affected Third Party – Risk Management Plan Notification* letter(s).