

Contaminated Sites – Q&As

[Contaminated Sites Legal Instruments – Approval in Principle \(AiP\)](#)

[Contaminated Sites Legal Instruments - Certificate of Compliance \(CoC\)](#)

[Contaminated Sites Legal Instruments - Contaminated Soil Relocation Agreement \(CSRA\)](#)

[Contaminated Sites - General](#)

[Legislation and Regulations](#)

[Liability – General](#)

[Liability - Orphan Sites](#)

[Ministry Services & Fees](#)

[Risk Assessment - General](#)

[Risk Assessment - Screening Level Risk Assessment \(SLRA\)](#)

[Site Information Requests & the Site Registry](#)

[Site Investigation and Remediation Process - Approved Professionals Process](#)

[Site Investigation and Remediation Process - Discharge and Disposal \(Discharge Authorizations\)](#)

[Site Investigation and Remediation Process - Independent Remediation](#)

[Site Investigation and Remediation Process – Orders](#)

[Site Investigation and Remediation Process - Remediation – General](#)

[Site Investigation and Remediation Process – Site Investigation](#)

[Site Investigation and Remediation Process - Site Profiles](#)

[Site Investigation and Remediation Process - Site Risk Classification](#)

[Vapour Investigation and Remediation – General Technical Guidance](#)

[Vapour Investigation and Remediation - Refining the list of vapour PCOCs](#)

[Vapour Investigation and Remediation - Characterizing vapour contamination](#)

[Standards – General](#)

[Standards - Water Use Determinations](#)

[Standards - Water Use Evaluation](#)

[Types of Contamination - Hazardous Waste](#)

[Types of Contamination - Illegal Drug Laboratories](#)

[Types of Contamination - Mine Sites](#)

[Types of Contamination - Contaminant Migration](#)

[Types of Contamination - Spills](#)

[Types of Contamination - Storage Tanks](#)

Contaminated Sites Legal Instruments - Approval in Principle (AiP)

1) Can an Approval in Principle be amended?

Yes. Amendments to Approvals in Principle can be made when requested by an applicant. The final decision will be made by a Director of Waste Management under the Act regarding whether to issue an amendment and if so, on the details of the changes. Persons requesting a minor amendment would be required to pay a fee of \$165 per hour that a person works on behalf of the ministry in relation to the amendment.

If an amendment is requested and there have been significant changes in contaminated sites legal requirements, policy or guidance since the original Approval in Principle was issued, the Director may decline to amend an existing Approval in Principle. One example is where there has been a significant change in the environmental quality standards for substances which cause contamination at the site. In that case, if a client still wishes an Approval in Principle for the site, he or she must submit an application for a new Approval in Principle, and that would require payment of fees following the requirements of the Contaminated Sites Regulation for new applications for Approvals in Principle. Both flat fee and hourly fees may be required, depending on the length of time the ministry takes to process the application for a new Approval in Principle.

2) For Approvals in Principle issued through Protocol 6, what happens if remediation is not completed at a site within five years of the ministry issuing the Approval? Will the ministry follow up with legal action?

The director may rescind an Approval in Principle if conditions in the instrument, including completion timelines, are not complied with. The ministry may order action at noncompliant sites. However, such action is typically viewed as a last resort. The ministry is developing a comprehensive compliance strategy to address such issues.

Approvals are issued on the basis of an applicant's commitment and a professional's judgment regarding the proposed remediation and completion timeline. Where it is anticipated or known that the conditions of an Approval in Principle will not or have not been met within the approved 5 year time limit, a new Approval in Principle should be sought. Additional investigations, risk assessment and remediation may be required to update the instrument to current site conditions and regulatory requirements.

3) Is it possible to obtain an Approval in Principle for an offsite portion of a contaminant management area independent of an application for a legal instrument for the contaminant source site?

Yes an Approval in Principle may be issued for an offsite area in the absence of an Approval in Principle or Certificate of Compliance for the source parcel provided that one of the following conditions is met:

1. Contamination in the offsite area under the Approval in Principle will be remediated to numerical standards within 5 years;
 - The remediation plan must include measures to prevent the migration of contaminants to the offsite area and downgradient parcels from the source parcel. These measures would be implemented by either the source parcel owner or the affected parcel owner according to the requirements in Protocol 6, "Eligibility of Applications for Review by Approved Professionals".
2. If contamination is not to be removed from the offsite area then contamination migrating from the source parcel must be risk managed;

The remediation plan must:

- Contain a risk assessment demonstrating that risks are acceptable at the affected property(s) under current conditions;
- Depending on circumstances, require monitoring to demonstrate unchanging conditions or reduced contamination at the upgradient boundary or plume front on the affected lands; and
- Confirmation in writing that the affected parcel owners are in agreement with the risk-based approach and any associated restrictions on their use of the land must also be provided (under Protocol 6 a communication record is required when the instrument application is submitted to the ministry).

3. A combination of numeric and risk-based remediation at the affected parcel(s).

The remediation plan must include:

- measures to prevent the migration of contaminants to the offsite area and downgradient parcels from the source parcel. These measures would be implemented by either the source parcel owner or the affected parcel owner according to the requirements of Protocol 6.
- a risk assessment demonstrating risks associated with residual contamination once the above measures are in place will meet the risk-based standards of the Contaminated Sites Regulation;

- possible implementation of groundwater or soil vapour monitoring of affected lands; and
- Confirmation in writing that the affected property owner(s) are in agreement with the risk-based approach. Any associated restrictions on their use of the land must also be indicated (under Protocol 6; communication record is required if the instrument application is directly to the ministry).

4) I have been advised that I am unable to apply for an Approval in Principal for my property that has been impacted by an up-gradient source because "...contingencies on activity or works to be undertaken on the source site..." What does this mean?

If the Approval in Principal (AiP) relies on remediation or containment activities taking place on a source site then it cannot be considered independent of the source and an AiP or Certificate of Compliance would have to be in place for the source site when the AiP is issued for affected properties.

Contaminated Sites Legal Instruments - Certificate of Compliance (CoC)

1) How long does it take to receive a Certificate of Compliance?

It depends on the type of Certificate of Compliance requested. Once an application for a Certificate has been received by the ministry, for Certificates issued under the numerical standards it usually takes 2 to 4 weeks. For Certificate requests where risk-based standards are used, it can take up to a year and sometimes longer.

2) A landfill will be closed under the permit process under the *Environmental Management Act* with a provisional approval and will include monitoring over 2-3 years as well as the installation of an engineered cover. Will the facility owner or operator require a Certificate of Compliance once the ministry approves the permit abandonment?

The *Environmental Management Act* and Contaminated Sites Regulation have a number of triggers for a proponent to take specific actions. Decommissioning of an industrial site, including closure of a landfill, is one trigger to submit a site profile. The ministry's decision on the site profile would very likely be to undertake investigations. A site investigation required decision would block the ability of the local government to issue future authorizations (e.g., development, subdivision or rezoning) until

a contaminated sites legal instrument (Approval in Principle, Certificate of Compliance or Determination of Contaminated Site) or other release has been issued for the site. Therefore, we recommend that the site owner or operator take into consideration the requirements of the contaminated sites legal regime in the context of future land use options at the site.

3) Light extractible petroleum hydrocarbons believed to be introduced during the investigative drilling process were found on site during the site investigation phase. When groundwater samples taken from the same area were assessed after remediation contamination concentrations were reduced to below detection limits. Should the presence of the LEPHw be listed on the Certificate of Compliance?

If a contaminant was present on site and remediated, it should be listed on the Certificate of Compliance, regardless of the source.

4) Our property and adjacent commercial property have been investigated and remediated to risk-based standards and is eligible for review under Protocol 6. Is there an advantage to obtain separate certificates for the onsite and offsite areas versus a single certificate for all impacted lands (aside from cost)?

As long as the source and affected sites are separate sites, the owner of the affected site enjoys an exemption from remediation liability under that subsection of the *Environmental Management Act*. Further, the owner of the affected site would not be liable for remediation of the source site.

However, if the two sites are united into one site, then both owners of the former source and former affected sites become responsible persons for the entire extent of contamination at the combined site. That is, the former source site owner would continue to be responsible for contamination at the former source site and migrating from that site to the affected site. As well, the owner of the former affected site would become jointly responsible for contamination at the former source site, but would not be responsible for contamination at the former affected site.

For these reasons the owner of the affected site might want to consider it carefully before agreeing to one Certificate of Compliance for both sites. The affected site owners should understand their potential liabilities if unification of the two site were to proceed.

5) A certificate of compliance recently issued to our site included the following clause:

“Buildings constructed on the site shall be of slab-on-grade design with no underground basements or parking garages installed into the existing fill soil unit; except if vapour vents or barriers are installed which have been designed by a qualified environmental engineer.”

At the site a vapour attenuation factor (VAF) of 0.02 was applied.

Under certain circumstances we have applied a 0.02 VAF to deeper soil vapour data in order to assess whether indoor air above foundations in closer proximity (i.e., future basements) are acceptable. This is an approach recommended in the MoE Q&As. However, it would appear that even though we have taken a conservative approach to evaluate these future receptors, the certificate condition would still require a mitigative measure if a basement were constructed in the future.

I am particularly confused because Technical Guidance 4 indicates that the instrument will be limited to the range of configurations assessed. If we have conservatively applied a 0.02 VAF to assess a future basement, then our instrument should reflect that future basements can be constructed. But this doesn't seem to be occurring.

Please note that this question refers to an historical contaminated sites legal instrument clause which is unlikely to be used in its current wording in future instruments because the wording "except if vapour vents or barriers are installed which have been designed by a qualified environmental engineer" is inconsistent with current provisions of Technical Guidance 4.

The clause you have highlighted is included to identify the presence of contaminant vapours in the sub-surface. For numeric-based remediation, this clause is an essential component of the instrument as it is the only indication of presence of sub-surface vapours. For risk-based submissions this clause is also important, as ownership and development plans for properties can change to a scenario that may not have been evaluated under the risk assessment.

6) We have an existing and future commercial site where we are going to apply for a risk-based Certificate of Compliance. Soil contamination is present on site, including at shallow depths (e.g. 0.3 m bgs). To pass the ecological component of the risk assessment, paving has to be present over the area of the soil contamination. It is and

the plan is for it to remain. What would be the ongoing reporting requirements for this site once a certificate has been issued?

The following would be required:

- “Risk management measures required to satisfy risk-based standards shall be implemented...” and the need for intact paving would be identified (Condition 1)
- performance verification (such as inspections of the pavement) is required (Condition 2);
- performance verification records need to be kept and may need to be produced if requested by the director (Condition 3); and
- regular reporting would not be required, however the director may ask for a statement on whether conditions set out in Schedule B of the certificate are being met (Condition 4).

Contaminated Sites Legal Instruments - Contaminated Soil Relocation Agreement (CSRA)

1) Does the ministry maintain a list of facilities that will accept contaminated soil?

The Ministry of Environment does not maintain such a list. However, many contaminated soil remediation companies own facilities around the province. Also, many municipal landfills are authorized to accept contaminated soil. Please check directly with the facility operators.

2) Does a CSRA require soil vapour investigation?

Yes. The standards that trigger the requirement for a CSRA include Schedule 11 (generic numerical vapour standards) of the Contaminated Sites Regulation. Soil vapour investigation must be completed at the source site and the receiving site prior to the transport of any soils, if a CSRA applies.

3) For the purposes of a soil relocation agreement, is a site with multiple legal lots considered a single site?

If the activity that has caused contamination has occurred on several adjoining legal lots (e.g., a sawmill occupying several Parcel Identification Numbers) then the combined lots are considered a single site and movement of contaminated soil around the site does not require a Contaminated Soil Relocation Agreement.

4) Is a Contaminated Soil Relocation Agreement required if soil meets the applicable land use standards at the receiving site?

Unless exemptions apply as set out in section 41 of the Regulation, a Contaminated Soil Relocation Agreement is required if any of the following conditions are present:

- soil quality exceeds concentrations in Schedule 7, Column II (if the receiving site is non-agricultural land e.g. urban park land, residential land, commercial land, industrial land or wildlands) or Column III (if the receiving site is agricultural land);
- soil quality exceeds concentrations in Schedule 10, Column III;
- vapour concentrations exceed those for the land use at the receiving site as set out in Schedule 11 Column III (agricultural, urban park, and residential land), Column IV (commercial land) or Column V (industrial land), as applicable.

5) What purpose does Column IV of Schedule 7 actually serve in regard to triggering a Contaminated Soil Relocation Agreement, if exceedances of Column II (or Column III for agricultural sites) trigger a Contaminated Soil Relocation Agreement for Schedule 7 substances?

Where the source soil exceeds the Column IV values, the soil may only be moved under a Contaminated Soil Relocation Agreement if a risk assessment is conducted for the receiving site. This is currently done, for example, when soil is to be treated on separate property such as in a properly designed biocell so that there is no discharge of waste to the environment. It is also important to note that all hazardous waste must be treated at a facility authorized to accept that material.

6) Why isn't there a parallel trigger for soil concentrations as there is for vapour and why is the structure of Contaminated Soil Relocation Agreement trigger requirements different for vapour than for soil in CSR Section 40(2)?

The provisions in subsection 40 (2) (a) (for soil) and for subsection 40 (2) (e) (for vapour) are written differently because the environmental quality standards for soil (e.g., "Groundwater used for drinking water" in the matrix standards) for a number of substances reflect site-specific factors such as pH. The vapour standards in Schedule 11 don't vary in this way so the text describing the requirement for vapour is considerably simpler than that for soil.

7) Contamination from a source site has migrated onto the adjacent roadway. Can the contaminated soil from the roadway be treated on the source site without a CSRA?

Yes, the contaminated soil may be treated on the source site without a CSRA (it must be clear that the source of contamination is migration from the source property and the impacted property is adjacent to the source property). Any soil stored and treated on the source property would have to comply with requirements of the *Environmental Management Act* and regulations. For the purpose of a CSRA the source and affected sites are considered one site.

8) If soil is sent out of province for processing and the resulting soil is returned to the source site, is a CSRA required?

If any soil with concentrations of substances exceeding CSR Schedule 7 standards is to be imported into the province a CSRA would be required. If the soil quality exceeds applicable land use standards for the site, a risk assessment may be required as part of the application. This would enable the ministry to determine if the risk-based standards of section 46 of the CSR would be met.

9) Is a CSRA required for temporary storage of contaminated soil at an intermediate site en route to an authorized disposal facility?

Yes, if contaminated soil is temporarily stored en route to an authorized facility, a CSRA is required unless the intermediate site is under federal jurisdiction (such as first nations reserve land) or is a site authorized to take waste. In support of the CSRA, the ministry would require details on the method of storage, length of storage and confirmation the soil has been transported to its final destination. Another CSRA would not be required when the soil is ultimately relocated to an authorized facility.

10) Is it necessary to assess pH at the source site?

It may be necessary to assess soil pH at the source site if cadmium, copper, zinc and/or pentachlorophenol are potential contaminants of concern to determine whether the site is contaminated above land use standards for the receiving site. Also, pH measurements may be required to determine if the soil is hazardous waste and requires special management.

11) Soil that meets commercial land use standards is to be moved to a property zoned residential but currently is used for commercial purposes (a golf course). Is a risk assessment required if some of the soil to be relocated exceeds residential land use standards?

Under the Contaminated Sites Regulation golf courses are defined as having a commercial land use. As long as the soil to be relocated to a commercial property meets the commercial land use standards, no risk assessment would be required.

12) In Technical Guidance 20 Checklist 1 Part 1, Question A-8 asks "Will the dredged marine or estuarine material be relocated to land other than undeveloped land? If a site had a liner (above bare or vegetated soil), would the site no longer be considered undeveloped land? (i.e. a geotextile and/or low density polyethylene liner with gravel cover above). Would agricultural land be considered undeveloped land?"

As per our [Definitions and Acronyms for Contaminated Sites Procedures](#) "undeveloped land" means any bare or vegetated soil, excluding:

- (a) gravelled walkways,
- (b) roadways or highways and associated roadside or highway margins, (c) parking areas, (d) soil contained and isolated in planters and similar structures, and (e) storage areas at active commercial and industrial operations.

Based on the above definition, a liner on a site does not make it a "developed site", and will still be considered "undeveloped land" if it meets the above definition. Agricultural Land would only be considered undeveloped if it meets the above definition.

The liner does not dictate the land use, rather, it is a risk management measure which can be used irrespective of the land use.

13) I have stockpiled soil on my site that contains contaminants in the soil that exceed the Contaminated Sites Regulation Schedule 7 triggers but meets the local background concentrations as indicated in Technical Guidance 17. Do I need to complete a Contaminated Soil Relocation Agreement to relocate this soil within the same geographic region?

No. This would count as an exemption for the requirement for a Contaminated Soil Relocation Agreement.

Contaminated Sites Legal Instruments - Determination of Contaminated Site

1) My client is obligated to obtain a contaminated sites legal instrument for her property as a condition of sale. The site has no history of development. Can I obtain a Determination of Contaminated Site for a site with no areas of potential concern or no potential contaminants of concern?

Yes. A Determination (site not contaminated) may be issued if it can be adequately shown that the site is undeveloped, has never had a Schedule 2 activity and there is no reason to suspect that there is any contamination.

**2) Is the Ministry of Environment able to issue instruments (e.g. Determinations, Approvals in Principles and Certificates of Compliance) for land under federal jurisdiction such as first nations' reserves?
Is there a federal equivalent to the above provincial instruments?**

In principle the ministry would be willing to issue a Certificate of Compliance for a site on First Nations land. It would indicate that the site met provincial contaminated sites remediation standards under the *Environmental Management Act* and could be useful for a site owner wanting to address provincial contaminated sites liability or to obtain business certainty or bank financing. You might want to obtain legal advice on the legal effect of such an instrument. We are unaware of the existence of a federal equivalent to a Certificate of Compliance.

3) Can a determination that a site is not a Contaminated Site be obtained for a site that has undergone remediation?

In general, no. The environmental quality standards for determining if a site is contaminated are different from the standards for evaluating the success of remediation. While the numerical standards in section 11 of the Contaminated Sites Regulation are used to determine whether or not a site is contaminated, the remediation standards in sections 17, 18 and 18.1 are used to certify that a site has been cleaned up to the satisfaction of a Director of Waste Management.

There are a couple of situations where both a Determination of Contaminated Site and a Certificate of Compliance may be appropriate however:

Scenario 1

One could pursue a Determination that a site is not a Contaminated Site for a part of a site, where no

remediation was carried out in the area for the Determination application. A Certificate of Compliance would still be required for the remediated portion of the site.

Scenario 2

One could pursue a Determination that a site is not a Contaminated Site, if the site meets the environmental quality standards used for the Determination before remediation. For example, if a site were contaminated above Residential Land Use Standards but below Commercial Land Use Standards and then remediated to Residential Land Use Standards, one could obtain a Determination that the site is not a Contaminated Site to Commercial land Use Standards. However, it may be advantageous to obtain a Certificate of Compliance applicable to the more restrictive land use particularly if the site is to be rezoned, subdivided or redeveloped.

Contaminated Sites - General

1) I wish to use recycled concrete for aggregate. The source concrete is not contaminated but I understand that crushed concrete may increase soil pH and affect groundwater quality. What is the ministry's policy to reuse concrete as structural fill?

In general, crushed concrete may be used as structural fill provided the following guidelines are met:

- The material is contaminant free
- The material would not have an adverse impact on the receiving environment and not cause pollution if it were used as structural fill.

2) What professional qualifications are required to carry out a preliminary site investigation (PSI) at a site?

Section 63 of the Contaminated Sites Regulation sets out general requirements for documentation of professional qualifications in the context of an application for approval of a preliminary site investigation. That section requires the submission of a written signed statement certifying that the person signing the statement has demonstrable experience in remediation (which includes investigation) of the type of contamination at the site for which the statement applies.

3) We are applying for multiple instruments for a single site, is a separate Summary of Site Condition required for each instrument?

Only one Summary of Site Condition is required when multiple contaminated sites legal instruments are requested under a single Contaminated Sites Services Application where the legal instruments are

based on common reports (i.e., the same preliminary site investigation, detailed site investigation, remediation plan and/or confirmation of remediation reports). The Summary of Site Condition is essentially another report included in the application package.

4) Are we required to include hard copies of figures and plans with the Summary of Site Condition if these are included in submitted reports and referenced in the SoSC?

No.

5) I have been informed that effective April 1, 2013 the requirements related to obtaining preapprovals under the new Protocol 6 (version 8.0), "Eligibility of Applications for Review by Approved Professionals" have changed from those previously in effect under Protocol 6 version 7.0. I submitted a request for preapproval under Protocol 6 version 7.0, prior to April 1, 2013. Along with that Protocol 6 preapproval request, I also submitted a request for a background groundwater determination under Protocol 9, "Determining Background Groundwater Quality." Has the new Protocol 6 version 8.0 impacted my submission?

Requirements related to ministry approvals under Protocol 9, "Determining Background Groundwater Quality," and Technical Guidance 6, "Water Use Determination" have not been changed.

Compared to version 7.0 of Protocol 6, some requirements related to ministry preapprovals have been eliminated, some have been changed, and some entirely new requirements have been added, in Protocol 6 version 8.0.

All Protocol 6 submissions received by the ministry on, or after, April 1, 2013 will be processed in accordance with version 8.0.

In regard to submissions made under version 7.0 received by the ministry prior to April 1, 2013 the applicant may formally withdraw the submission under Contaminated Sites Regulation section 9 (19) in accordance with land Remediation Section [Procedure 10](#). If no such formal withdrawal is requested, the ministry will process the submission in accordance with the requirements of Protocol 6 version 7.0.

Applicants should carefully review any submission made under Protocol 6 version 7.0 to ensure that all current requirements under Protocol 6 version 8.0 have been satisfied. In the case that all current requirements under Protocol 6 version 8.0 have not been satisfied, a new submission dealing with the outstanding requirements under version 8.0 will be necessary.

The following table (see next page) is provided to assist applicants in comparing the preapproval requirements of Protocol 6 version 8.0 with the former Protocol 6 version 7.0

Protocol 6 version 8.0 Table 2 preapproval requirement – Item No.	Type of preapproval	Compared to Protocol 6 version 7.0 Table 1 preapproval requirement
<p>1</p>	<p><i>Involving the extent of the area of contamination delineated and remediated</i></p> <p>If the applicant for a contaminated sites legal instrument is a responsible person for the source parcel and has not delineated and/or remediated the entire area of contamination including contamination at a parcel and contamination which has migrated from that parcel to neighbouring parcels.</p>	<p>new</p>
<p>2</p>	<p><i>Involving background substance concentrations</i></p> <p>If, under the application, local background substance concentrations in surface water, sediments or vapour were derived by any methods.</p>	<p>Substantively changed</p>
<p>3</p>	<p><i>Involving orders</i></p> <p>If the application refers to a parcel currently subject to a preliminary or detailed site investigation order (excluding an order in response to the submission of a site profile under section 7.1 of the Contaminated Sites Regulation), remediation order, pollution prevention order or pollution abatement order under the Act.</p>	<p>Substantively changed</p>
<p>4</p>	<p><i>Involving Approvals in Principle</i></p> <p>If the application is for an Approval in Principle under which remediation is not expected to be completed within five years of the anticipated date of issuance of the Approval in Principle.</p>	<p>new</p>
<p>5</p>	<p><i>Involving risk assessments</i></p> <p>If the application refers to a parcel where risk-based standards will be applied under a risk assessment and the</p>	<p>Substantively changed</p>

	parcel has or requires a hazardous waste in situ management facility authorization.	
6	<p style="text-align: center;"><i>Involving risk assessments</i></p> <p>If the application is based on a risk assessment that includes any of the following:</p> <p style="text-align: center;">(a) probabilistic analysis;</p> <p>(b) toxicity testing of materials (soil, water, sediment), or organisms obtained at or from the parcel;</p> <p>(c) <i>de novo</i> modification of toxicity reference values; or</p> <p style="text-align: center;">(d) derivation or use of a site-specific risk-based concentration.</p>	<p>(a) same</p> <p>(b) same</p> <p>(c) changed</p> <p>(d) new</p>

The following preapprovals formerly required under Protocol 6 version 7.0 have been eliminated in Protocol 6 version 8.0:

Protocol 6 version 7.0 - Table 1

Item 2 Where the application refers to a parcel currently subject to a covenant under the Land Title Act respecting the management of contamination.

Item 3 Where local background substance concentrations were derived by methods other than adoption of regional background soil quality estimates in Table 1 of Protocol 4.

Item 5 Where the application is based on a risk assessment that includes any or the following:

- food chain modelling;
- weight-of-evidence arguments;
- assessments of the aquatic receiving environment.

Legislation and Regulations

1) What requirements have the provincial government put in place to regulate contaminated sites?

The *Environmental Management Act* is the main law governing contaminated sites in the province. Brought into force in July 2004 (replacing the former *Waste Management Act*), it lays out standards for site identification, assessment, and cleanup ("remediation"). Other provisions are set out in the Contaminated Sites Regulation. There are also a number of legally enforceable protocols in place. The contaminated sites legal regime includes a system to streamline the cleanup of non high risk sites.

The Ministry of Environment administers these legal requirements. The Land Remediation section has written various policies, procedures and guidance to help with interpretation and implementation of the legal regime.

2) Are there any penalties for noncompliance with contaminated sites legal requirements?

Yes, there are serious penalties for noncompliance. They include fines up to one million dollars and imprisonment up to six months. These penalties can be applied to persons, municipalities or corporations. Please see Sections 120 to 129 of the *Environmental Management Act* for details.

3) Are officers and directors subject to Remediation Orders?

Officers and directors may be responsible persons and therefore may be issued Remediation Orders.

Liability – General

1) Are my *Environmental Management Act* permits and Contaminated Sites Legal Instruments a liability shield?

No. Section 47(4) of the *Environmental Management Act* indicates that liability applies (a) even though the introduction of a substance into the environment is or was not prohibited by any legislation if the introduction contributed in whole or in part to the site becoming a contaminated site, and (b) despite the terms of any cancelled, expired, abandoned or current permit or approval or waste management plan and its associated operational certificate that authorizes the discharge of waste into the environment.

2) Is the polluter responsible for investigation of contamination as well as remediation?

Yes. Under the polluter pays principle incorporated into our contaminated sites legal regime, the polluter is generally responsible for remediation of a site, and under section 47(1) of the *Environmental Management Act* they are responsible for the reasonably incurred costs of remediation of the contaminated site, whether incurred on or off the contaminated site. Section 47(3) states that "costs of remediation" means all costs of remediation and includes, without limitation, costs of

preparing a site profile, costs of carrying out a site investigation and preparing a report, legal and consultant costs associated with seeking contributions from other responsible persons, and fees imposed by a Director, a municipality, an approving officer or the commission.

3) Who is responsible for remediation of property within a municipality if there is no other responsible party?

If a responsible person cannot be found or is unable to pay, then the Act relies on the Provincial government to clean up the highest risk orphan sites and thereby protect human health and the environment. After the cleanup is completed, the Province has the ability to recover the costs of remediation from previous site owners.

4) How far back can previous owners be held responsible for?

There is no time limit to liability. Section 45 of the *Environmental Management Act* indicates that previous owners and operators of sites can be responsible persons.

5) What is my liability if I purchase a contaminated site?

The remediation liability provisions are based on the "polluter pays principle". It holds that those who cause contamination should be responsible for paying the cleanup costs. An owner or operator is not responsible for remediation if he or she establishes that at the time the person became an owner of the site, the site was a contaminated site, the person had no knowledge or reason to know or suspect that the site was a contaminated site, and the person undertook all appropriate inquiries into the previous ownership and uses of the site and undertook other investigations in an effort to minimize potential liability.

6) Am I responsible for contamination of a neighbouring site caused by migration of contamination from my site?

Yes. Section 45(1) of the *Environmental Management Act* states that a person who produced a substance or caused the substance to be disposed of, handled, or treated in a manner that caused a site to become a contaminated site is responsible for remediation. Section 45(2) extends that responsibility to neighbouring sites contaminated by offsite migration, indicating that the source site

owner is responsible. Section 46(1)(j) exempts from responsibility a person who owns or operates a contaminated site that was contaminated only by the migration of a substance from other real property not owned or operated by the person.

7) If I accept the risk management strategy for contaminants which have migrated onto my property from an adjacent parcel will I become a responsible person?

As described in the response to the previous question, in general the owner or operator at the source parcel is responsible for cleaning up contamination. This exemption may not apply however, if the owner of the parcel contaminated by migrating contaminants exacerbates the contamination or changes the use of his or her site.

8) Can I get insurance for my contaminated sites liability?

Yes. Various types of insurance are available to cover the costs associated with existing contamination and its remediation. Your existing policies may also provide coverage. Please contact your insurance broker.

9) Can I negotiate my contaminated sites liability?

Yes. You can help limit your remediation liability through contractual provisions as part of land transfers. In legal disputes the courts will take these types of contractual agreements into account.

10) What should I do to minimize my environmental liability when selling an operating service station with contamination underlying the site?

We recommend that the present owner conduct a detailed site investigation to determine the nature and extent of contamination at the site. This information can be used in negotiations with prospective purchasers to help quantify the environmental liability associated with the site. Once the site is sold, this will be particularly important if the new owner decides to approach the previous owner to assist with the costs of remediation of any contamination at the site. The pre-sale site investigation should establish the degree of contamination at the time of sale and can be used to distinguish it from any new contamination that occurred after the service station was sold.

11) A user group has approached a landowner to gain access to a railway right-of-way. What are the requirements under the Contaminated Sites Regulation given that the user group would not actually own the property, just a right-of-way agreement from the owner?

Under the *Environmental Management Act*, the user group would become a responsible person because it controls the use of the land. This stems from the definition of "owner" in Part 4 of the Act. One way to shield a user group from remediation liability under that statute would be to obtain a contractual indemnity from the owner and confirmation from the owner that they are responsible for any contamination onsite. Also, the group could obtain confirmation from the owner that a detailed site investigation and risk assessment has been completed, which indicates that there would be no adverse human health or environmental impacts under the user group's proposed land use scenario.

12) For the scenario described in Question 11, would a Certificate of Compliance be required, and if so, who would be responsible for obtaining this given that the property would not be owned by the user group?

If either the owner or group needs to rezone or subdivide the land or if a development permit is required to construct a recreational path or associated facilities, then a site profile may need to be submitted to the local government in association with applications for these items. A Certificate of Compliance (which may be obtained by any person) is one mechanism which could be used to release the local government to approve an application for rezoning or development. Please refer to [Site Profiles](#) for further information.

13) Further to Questions 11 and 12, if a local government was interested in purchasing or expropriating the land mentioned above, how would that affect liability for remediation of a site?

We understand that if a government body expropriates land it also takes on the liability for remediation. If land is purchased, the sales agreement could specify what, if any, liability associated with contamination has been contractually transferred to the new owner. Under the contaminated sites legal regime, the new owner would also become a responsible person, so should take steps to minimize his or her liability exposure in the sales agreement.

14) Oil and gas exploration and production sites are generally not owned by the oil company. Many land owners are concerned that they may be liable for contamination caused on their property by oil and gas operations. Given that they have no ability to exclude entry to their land, under the *Environmental Management Act* do they have to prove that they are not a responsible owner, prove that their proportionate responsibility should be found to be 0%, or is there another exclusion mechanism?

There is an exemption in the *Environmental Management Act* dealing with this situation. Section 46 (1)(e) indicates that the following persons are not responsible for remediation of a contaminated site:

(e) an owner or operator who

(i) owned or occupied a site that at the time of acquisition was not a contaminated site, and

(ii) during the ownership or operation, did not dispose of, handle or treat a substance in a manner that, in whole or in part, caused the site to become a contaminated site.

With this exemption in place, it would be prudent for the land owner to ensure that the oil and gas operator carries out a site investigation described under the *Environmental Management Act* and provides the owner a site investigation report to demonstrate the condition of the land before the drilling begins at the site.

If there is a question about contamination at such a site after drilling has occurred and the site has been restored, and if a site investigation report obtained before the drilling began is not available, then either the land owner could request the operator to do a site investigation and provide a report, or the owner could carry out an investigation and then seek compensation from the operator if the site is determined to be contaminated.

15) In accordance with Protocol 6, an offsite risk-based Certificate of Compliance recommended by an Approved Professional will not be issued unless the offsite property owner is in agreement. Does the same condition apply if the offsite Certificate is submitted to the ministry for review?

In that situation, the requirement for the consent of an affected offsite property owner for a risk-based Certificate of Compliance would be at the discretion of the Director of Waste Management.

Liability - Orphan Sites

1) Can a site owner apply for orphan status for their site in order to have government funds to investigate and remediate a site?

Section 58 of the *Environmental Management Act* describes the authority of the ministry at orphan sites. In general, orphan sites that the ministry has directed to be cleaned up are high risk sites that have been abandoned by their owners for financial reasons or where the owners are otherwise unwilling or unable to remediate their sites. Currently, no government funding

Ministry Services & Fees

1) What kind of grants or funding is available?

Currently, no provincial government funding is available to private land owners for site investigation and remediation other than that under the [B.C. Brownfield Renewal Program](#). Some funds may be available from the Federal Government under the Green Municipal Fund.

2) I have been ordered to submit a site investigation report for my site. Does GST apply to this submission?

Yes. Under Section 9 (1) of the Contaminated Sites Regulation "a person who undertakes an action described in Column I of Table 1 of Schedule 3 must pay the fee set out opposite the action in Column II." and, under Section 9(4) of the Contaminated Sites Regulation, the "tax imposed under Part IX of the *Excise Tax Act (Canada)*, if payable, must be added to the fees payable." A review of a site investigation report is a Schedule 3 activity and is subject to all fees and applicable taxes.

Risk Assessment - General

1) Could you please confirm whether a risk assessment must include evaluation of impacts on a construction, utility or maintenance worker in a trench or on ground surface at a site (including offsite areas contaminated by an onsite source)?

The ministry would normally expect a risk assessment performed for contaminated sites regulatory purposes to evaluate risks to all receptors at a site or impacted from a site. This would typically include assessment of risks to occupational-related exposures, and particularly such exposures arising

from remedial activities performed at a site. Note that [WorkSafe BC](#) has primary responsibility for worker's health and safety within the workplace so the requirements of that agency must also be considered.

2) My question relates to the need for, and nature of, ecological risk assessment to address Fe and Mn in groundwater. Aquatic receptors will be ruled out as receptors of potential concern on the basis of higher natural concentrations of Fe and Mn in the marsh compared to the upland areas (site and RL properties) - Protocol 9 Background release as noted above. Are we required to conduct quantitative ecological risk assessment to address potential impacts to plants and soil invertebrates associated with Fe and Mn in shallow GW (i.e., < 1 m depth at some times)?

If your goal is only to achieve compliance with the Part 4 of the *Environmental Management Act* (EMA), then no. The policy is as follows: if the pathway for receptor exposure to iron and manganese is not addressed in the numerical standards of the CSR, then the pathway does not need to be addressed in the risk assessment when assessing compliance with the CSR.

3) The Tier 1 Ecological Risk Assessment Policy Decision Summary provides a list of EC_x values that provide varying degrees of protection to ecological receptors for different land uses. Agriculture and urban park land uses have a listed value of EC₁₀ which is different from the EC₂₀ value provided for these land uses in Protocol 1. Which EC_x value should be used for agricultural and urban park uses?

EC₂₀ is the appropriate value for agricultural and urban park land uses. The use of EC₂₀ for agriculture and urban park will result in two levels of protection for land uses in B.C. which is consistent with the two levels in the current standards derivation protocol. Note however, that the ministry's standards derivation protocol is under review and in the future the EC_x value may change.

Risk Assessment - Screening Level Risk Assessment (SLRA)

1) What is the overall purpose of SLRA?

SLRA is a screening tool that may be utilized on a voluntary basis at contaminated sites. It provides screening mechanisms primarily for contaminants in the soil, vapour, and groundwater media where, subject to precluding conditions, it is deemed that the contaminants in the respective media pose an

acceptable risk to human and ecological health. SLRA may be used in support of an instrument application to the ministry and may also be used in tandem with remediation and/or Detailed Risk Assessment activities. For further information, please consult [Protocol 13](#).

2) What is the linkage between SLRA and DRA?

SLRA and Detailed Risk Assessment (DRA) are both risk-based approaches to site remediation. The approaches are independent of one another and vary in scope and complexity where SLRA is a constrained screening type risk assessment while DRA is an unconstrained comprehensive risk assessment. In terms of application, SLRA may be applied independent of, or in coordination with, DRA. However, where both SLRA and DRA are applied at a site, pathways screened using SLRA should be re-evaluated in the problem formulation stage of the DRA to confirm that the assumptions and conditions inherent in SLRA are satisfied at the site.

3) Are risk management measures allowed by the SLRA protocol?

Use of risk management measures is permitted in SLRA (e.g., placement of permanent barriers, cover material, groundwater control measures, etc.). Such measures could be utilized to render an exposure pathway as inoperable. Where a risk management approach is undertaken, prescription of monitoring, maintenance and reporting measures is required. Such measures must be specified in the SLRA report and referenced in the existing conditions in the approval in principle and certificate templates submitted as part of risk-based instrument applications to the ministry. This is to ensure that risk management measures undertaken to render a pathway as inoperable remain in effect into the future. Note that where the design and/or implementation of a particular risk management measure falls within the field of practice of a registered professional (e.g., P.Eng., P.Geo., P.Ag. or RPBio), sign-off by the respective registered professional of the risk management measure implemented (in support of a Certificate of Compliance application), or to be implemented (in support of an Approval in Principle application) must be included in the SLRA report.

4) What considerations are required when using the 1 m depth of contamination scenario in the human health and terrestrial soil exposure pathways?

The 1 m depth scenario (for soil contamination located greater than 1 m of ground surface) includes the requirement that contamination will not migrate vertically upwards into the 1 m interval of soil

(e.g., by capillary transport or diffusion). To account for any such potential vertical migration, an appropriate additional depth separation or use of a capillary break must be utilized.

5) The first paragraph in section 3.2 of Protocol 13 appears to indicate that SLRA may not be used at sites that contain one or more of the listed precluding conditions. This could limit the use of SLRA at contaminated sites. Was this the actual intent?

The intent of section 3.2 is to only preclude assessment of the listed substances or conditions in SLRA and not limit application of SLRA in its entirety. For example, in the case where groundwater contamination has migrated off-site and exceeds the CSR drinking water use standards (at sites where drinking water use applies), the SLRA preclusion would only preclude application of SLRA to the human health exposure pathway, all other exposure pathways could still be assessed using SLRA.

6) Ionizing organic substances are identified as a precluding condition. Is this correct as there are no soil and water standards available for such substances in the CSR schedules?

It is not correct. Ionizing organic substances are not included in SLRA at present due to the complexity associated with the pH and temperature dependency of the Koc parameter for the substances.

7) I interpret the deep-rooting plants or trees precluding condition to apply to vegetation larger than grass or ornamental plants. Is this interpretation correct?

The deep-rooting plants or trees precluding condition applies to any plants or trees.

8) Can an upstream oil and gas drilling site with contamination below 1 metre depth be reclaimed with plants with root depths less than 1 metre to satisfy the precluding condition?

Reclamation with shallow rooting species would technically result in the precluding condition not applying at the site. However, as noted, this type of reclamation measure is essentially a mitigation measure and therefore would need to be monitored and maintained into the future to ensure that the system remains shallow rooting.

9) With respect to questions HS-3 and TS-3 (is the ground surface uncovered?) in the SLRA questionnaire, if a liner was buried above the contamination to seal it off from the surface, I assume the contamination would be considered covered. Is this interpretation correct?

An appropriately designed liner system would be considered an example of a satisfactory permanent barrier.

10) Can the vapour exposure pathway be applied at any site? If applicable, how is the pathway actually assessed?

The vapour exposure pathway may only be assessed at sites where wildlands land use applies. There is no screening mechanism available for the human health vapour exposure pathway in SLRA for non-wildlands land use sites.

Following the introduction of vapour standards in the Stage 6 amendments to the Contaminated Sites Regulation, the pathway is assessed by: 1) comparison of site vapour concentrations to the vapour standards in CSR Schedule 11 (HV-1); and 2) comparison of calculated vapour exposures relative to the prescribed scenario exposure durations (HV-2).

11) For an upstream oil and gas site, if it is determined that there is terrestrial habitat, but that salt contaminated soil was present at the site and located at a depth of >1 m and everything else passed on the SLRA, would the SLRA fail? Most of the oil and gas sites would be considered suitable terrestrial habitat, so does that automatically preclude them from using the SLRA?

The environmental health terrestrial soil exposure pathway would pass for this case as the pathway would be exited at TS-2 (contamination is not within, or may migrate to within, 1 m of ground surface). Application of SLRA at upstream oil and gas sites is not precluded.

12) I have a site where drinking water use applies and manganese in groundwater exceeds the CSR DW standards. However, the manganese plume has been delineated and is within the property boundaries. Would I still be required to complete the Forms A-1 and A-2 for the manganese concentrations in soil and groundwater at the site, or can I answer question HW-3 in the SLRA questionnaire with a "No" based on the

delineation data (i.e., manganese is delineated on the property and the source removed so concentrations would be declining with time)?

A "No" response for HW-3 can only be provided by applying Appendix A as per Note 9 of the SLRA questionnaire. This involves predicting the concentration of manganese at the property boundary using the leaching and groundwater transport assessment tools in Appendix A. This is a future prediction of plume extent as opposed to the current state of the plume. If the predicted concentration at the property boundary exceeds the CSR DW standards, then the water exposure pathway fails. The plume should then be addressed by further remediation and/or Detailed Risk Assessment.

13) Where there is a substance concentration that exceeds the applicable standards in groundwater but not in soil (e.g., manganese), is leachate assessment necessary when applying Appendix A?

As the substance concentration does not exceed a soil standard (or have a soil standard as the subject substance), it is difficult to determine what soil should be tested for leachate assessment. Accordingly, only application of the groundwater transport assessment in Appendix A is necessary for the substance exceedance in groundwater in such cases.

14) For sites where it is not possible to apply an exposure pathway in SLRA because of a precluding condition, how do I complete the questionnaire for the respective pathway as only a Yes/No option is provided?

For sites where the application of an exposure pathway is not possible because of a precluding condition, it is satisfactory to mark in "n/a" as the Yes/No response to the respective questions in the SLRA questionnaire and to specify the respective precluding conditions in the SLRA report. For example, for a site where it is not possible to apply the human health water exposure pathway (HW) because groundwater contamination extends off the parcel (at parcels where drinking water use applies), then a "n/a" response should be provided for question HW-1 in the SLRA questionnaire and groundwater contamination migration onto a neighbouring site should be identified as a precluding condition in the SLRA report.

15) Questions TS-4 and TS-5 of the SLRA questionnaire (environmental health terrestrial soil exposure pathway) are indicated to be completed by a registered professional biologist. How is this to be documented in the SLRA report?

Signature by the registered professional biologist should be included in the signatory section of the completed SLRA report.

16) With respect to the analytical methods for determining soil leachate concentrations, what is the rationale for requiring TCLP analysis for soil pH of 5 to 5.5 for inorganic contaminants as the basis of the TCLP test is to simulate the generation of organic acids?

The TCLP test was selected for the soil pH range of 5 to 5.5 to be conservatively representative of leachate that may be developed in acidic soils based on the recommendation in the Science Advisory Board SLRA report. Although the test is intended to simulate biological degradation in municipal solid waste landfills, it is noted that both organic and inorganic contaminants may be leached in such environments and thus TCLP analysis is intended to be a conservative test in this regard.

17) In Section 3.2 (Precluding Conditions) of Protocol 13 (SLRA), one of the precluding conditions is soil vapours.

To me this means that you can still use Protocol 13 to screen a site with soil vapours, but that soil vapours for the site must be screened/assessed using Technical Guidance 4.

Is this interpretation correct?

Yes this is the case, a combination of Protocol 13 (for soil and groundwater) and Technical Guidance 4 (for vapour assessment) can be used at a single site.

18) Protocol 13's checklist question "HS-1" asks if soil concentrations exceed the "applicable standards". The footnote to this question directs an individual to use the applicable land use standards in Schedules 4, 10, and 5 (intake of contaminated soil). However there are no industrial land use standards (IL) for intake of contaminated soil values in Schedule 5.

In the absence of such values, how should one answer question HS-1 for industrial

sites contaminated with substances with Schedule 5 standards?

Should the Schedule 5 commercial land use "intake of contaminated soil" standards be used as default standards in completing Protocol 13?

Assuming that the site is industrial, no applicable human health protection soil standard is exceeded in Schedules 4 or 10 of the Contaminated Sites Regulation and provided no Schedule 5 "Human health protection – Groundwater used for drinking water" soil standard, if applicable, is exceeded, question HS-1 should be answered "No" in the Protocol 13, "Screening Level Risk Assessment" questionnaire.

No. The Schedule 5 "Human health protection - Intake of contaminated soil" standards for commercial land use should be used only for commercial land use sites (i.e., do not use the commercial Schedule 5 "Human health protection - Intake of contaminated soil" standards as "default" Schedule 5 industrial "Human health protection -Intake of contaminated soil" standards) when answering question HS-1 of Protocol 13.

Site Information Requests & the Site Registry

1) Who manages the Site Registry?

The minister appoints a Site Registrar to manage the Site Registry. The information is owned by the Crown. It is available to the public by purchase from BC OnLine or by request from ministry staff.

2) How do I find out if a site is contaminated?

If the ministry has information about a specific site, it will be registered on the ministry's Site Registry. You can search it through BC Online. You can also perform an area-based search around your property for registered sites. If you are purchasing a site and you are looking for information about it, the first thing to do is to ask the vendor. If a property you are considering buying had commercial or industrial activities occurring on it in the past, the vendor is obligated to provide you with a site profile.

3) Is there a legal responsibility to register a site and when does this occur?

There are a number of triggers by which the ministry is informed about the existence of sites in B.C. These include applications for contaminated sites legal instruments and services, notifications of

independent remediation and offsite migration, and the receipt of site profiles. The Site Registrar is legally obligated to record such information on the Site Registry.

4) Are First Nations exempt from paying fees for querying the Site Registry?

No, like all government agencies, groups, and other Site Registry users, First Nations can only access the electronic information on the Site Registry through BC Online and that access is subject to fees. However, the ministry has provided the GeoBC Division (<http://geobc.gov.bc.ca/>) of the Integrated Land Management Branch a copy of the SITE database for use by First Nation groups. SITE is the basis of the information contained in the Site Registry.

Site Investigation and Remediation Process - Approved Professionals Process

1) Is the use of hydrogeological modeling to predict transport and fate of dissolved contaminants in groundwater under a risk-based remediation approach eligible for the Approved Professional process under Protocol 6?

The use of hydrogeological modeling to demonstrate an inoperative exposure pathway in a risk assessment, pre- or post-remediation, is eligible for review under Protocol 6 without preapproval. Hydrogeological modeling should be performed by a qualified professional.

2) Regarding requests for preapproval under Protocol 6:

a) Does the risk assessment need to be submitted with the Application?

A comprehensive risk assessment report is not normally required. However, we do expect an appropriately detailed technical report relating to the requested preapproval which includes:

- a description of the type of application requiring preapproval under Table 2.
- The reason for which preapproval is requested (e.g. scientific and/or legal reasons)
- relevant site information, at a level of detail appropriate to the requested preapproval, and
- a complete rationale for the preapproval, including any additional supporting information and data interpretation.

b) How long will the preapproval process take?

The ministry response time will depend on the nature of the requested preapproval and adequacy of the technical report. For properly completed applications dealing with simple regulatory authorization

(e.g. approval to use a standardized alternate methodology in risk assessment) the ministry aims to respond within two weeks. More complex applications for preapproval (e.g. risk assessment based on non-standardized or novel risk assessment methods) will likely require a considerably longer period of ministry review and approval and may necessitate the submission of additional information by the proponent.

c) Are their time limitations built into the process?

No, there are no time limitations built into the process other than the time it will take the ministry to review the application and for proponents to respond to any requests for additional information.

3) With respect to Protocol 6, can an applicant request preapproval for Approved Professional review of a "high risk" site?

Section 4.3 provides a Director with the ability to require a recommendation from an Approved Professional for a high risk site. However, at this time, Protocol 6 does not provide a provision allowing an Approved Professional to request preapproval of a recommendation for a high risk site.

4) We were planning on applying for an affected parcel offsite Certificate of Compliance for a contaminated third party property shortly via the Approved Professional process. We were not planning on applying for a Certificate for the source parcel at this time. Can you confirm that such is not prohibited by the requirement of Section 4.5 for delineation and remediation of the entire area of contamination at a parcel and any contamination which has migrated from that parcel to neighbouring parcels?

You can apply for a Certificate of Compliance for the affected parcel without obtaining a Certificate of Compliance for the source parcel. To do this, we expect that the source parcel will be remediated under the independent remediation approach and that the following requirements from Protocol 6 in Table 2, item 4 will be met:

The application includes the following written statements confirming that any measures necessary to prevent recontamination of that affected parcel by the contamination originating at the source parcel have been put in place:

(i) by an Approved Professional, that the design of any works or implementation of other measures required in the opinion of the Approved Professional to prevent recontamination of the affected parcel from the source parcel will, if operated and maintained as specified by the Approved Professional, prevent recontamination of the affected parcel; and

(ii) by the current owner or operator of the source parcel, that any works or measures intended to prevent recontamination of the affected parcel will be implemented, operated, and maintained according to the Approved Professional's specifications and any requirements in a Certificate of Compliance or Approval in Principle issued for the source parcel; or

(iii) by the current owner or operator of the affected parcel, that any works or measures intended to prevent recontamination of the affected parcel will be implemented, operated, and maintained according to an Approved Professional's specifications and any requirements in a Certificate of Compliance or Approval in Principle issued for the affected parcel.

5) How is it determined when a Numerical Standards Approved Professional or a Risk-based Standards Approved Professional should make a recommendation that a contaminated sites legal instrument be issued by a Director?

In general, Approved Professionals should sign off only on the work which they have been given the authority and have the necessary expertise and qualifications to approve.

Determinations of Contaminated site must come with the recommendation of a Numerical Standards Approved Professional because they are based solely on an evaluation under the numerical environmental quality standards.

Under the Act, a site which has been issued an Approval in Principle or Certificate of Compliance (to meet either the numerical or risk-based standards) is considered to have been contaminated before the instrument was issued. Whether a site is contaminated is decided only on the basis of the numerical standards, so a Numerical Standards Approved Professional would always be required to make a recommendation for an Approval in Principle or Certificate of Compliance (assuming a recommendation is required by an Approved Professional under Protocol 6 that the instrument be issued).

Risk-based standards Approved Professionals are required to provide recommendations if the Approval or Certificate is risk-based but who should provide additional signatures depends on the type of risk assessment performed and the characteristics of the site.

If the risk assessment was a screening level risk assessment, it may be signed off by a Numerical Standards Approved Professional but if a detailed risk assessment was done, a Risk-based Standards Approved Professional is required to sign the instrument. Where the risk assessment involves specialized expertise (e.g., groundwater pathway analysis by a hydrogeologist) then an individual who has the necessary expertise for such work should be involved and sign off that aspect of the instrument.

6) In Section 7.3 of the Summary of Site Condition, Arm's Length Review, if the submission was for a Certificate of Compliance to risk-based standards and no substances were remediated to numerical standards, is the required Approved Professional signature for both the Numerical Standards Approved Professional and the Risk-based Standards Approved Professional, or only the Risk-based Standards Approved Professional given that the recommendation is only for risk-based standards.

Approved Professionals should sign off only on the work which they have been given the authority and have the necessary expertise and qualifications to approve.

Even though there was only remediation to risk-based standards, the site investigation reports were used to determine if the site was contaminated, so a Numerical Standards Approved Professional must sign the Summary of Site Condition. Who should provide any additional signatures depends on the type of risk assessment performed and the characteristics of the site.

If the risk assessment was a screening level risk assessment, the Summary of Site Condition may be signed off by a Numerical Standards Approved Professional but if a detailed risk assessment was done, a Risk-based Standards Approved Professional is required to sign the Summary of Site Condition.

Where the risk assessment involves specialized expertise then an individual who has the necessary expertise for such work should be involved and sign off that aspect of the Summary of Site Condition.

Site Investigation and Remediation Process - Discharge and Disposal (Discharge Authorizations)

The appropriate ministry [Waste Discharge Authorization](#) should be consulted where the discharge is not associated with contaminated site remediation or the discharge is at an offsite management facility. For information on how to apply for a waste discharge authorization refer to the key topic, "[Activities Requiring Authorizations](#)" on our website. Information on the management of hazardous waste can be found [here](#).

Additional information on recycling, pollution prevention, waste avoidance, disposal options and regulations is available through the Regional Operations Branch and the RCBC Recycling Hotline, a free, province-wide information service. Toll free: 1-800-667-4321; Lower Mainland: 604 RECYCLE (604 732-9253) or <http://www.rcbc.bc.ca>

1) How do I dispose of contaminated soil?

Contaminated soil which has been treated to appropriate standards may be reused onsite or at an alternate suitable location. A Contaminated Soil Relocation Agreement is generally required in order to

move soil to an alternate site for reuse unless the site is authorized to accept contaminated soil. Where soil contaminant concentrations exceed hazardous waste standards, the soil must be managed in accordance with the Hazardous Waste Regulation.

2) Is monitoring of discharge required?

Monitoring requirements may be set out in an authorization or permit under the *Environmental Management Act*. Discharge monitoring may also be included as a condition in a contaminated sites legal instrument issued by the ministry (e.g. Approval in Principle of a remediation plan, Certificate of Compliance). Where a discharge permit or authorization is not required, monitoring of the treatment system is warranted to ensure that the discharge quality remains acceptable.

3) What are the criteria for discharging to public works?

The ministry regulates the "end of pipe" discharge to the environment. Requests to discharge to works (e.g. sanitary or storm sewer) must be directed to the utility owner (usually the local government). Requirements for discharge to municipal or private works will vary with each utility owner.

4) What are the criteria for discharging to the environment?

The criteria depend on the type of discharge, contaminant and receiving environment. The discharge must not cause pollution or present a risk to public health. Where a permit is required, detailed assessment may be necessary to establish acceptable discharge concentrations.

5) What are the penalties for disregarding disposal laws?

Part 10 of the *Environmental Management Act* (Sections 120 - 128) sets out offences and penalties. As an example, illegal release of hazardous waste into the environment, according to section 120(3)(b) carries a fine not exceeding \$1 million or imprisonment for not more than 6 months, or both.

6) When is a discharge permit needed for air?

For air discharges within Metro Vancouver, see the [Air Quality Management Bylaw No. 937](#). The Ministry of Environment has jurisdiction for air discharge elsewhere in B.C. Waste discharges

associated with contaminated site remediation generally require site-specific authorization because "Contaminated Site Contaminant Management" is included in Schedule 1 of the Waste Discharge Regulation.

7) When is authorization required for management of contaminated soil?

Authorization is not required to treat contaminated soil on the site it originates from (the source site), provided the soil is not hazardous waste and there will be no discharge to the environment. A Contaminated Soil Relocation Agreement is generally required to store or treat contaminated soil at an offsite location (i.e. location other than the source site), unless it is an authorized management facility. Requests for authorization to discharge contaminated soil (i.e. dispose) or operate a contaminated soil management facility at an offsite location should be directed to the ministry's Regional Operations Branch.

Where soil contaminant concentrations exceed hazardous waste standards, the soil must be managed in accordance with the Hazardous Waste Regulation under the *Environmental Management Act*.

8) When is a discharge permit needed for water/effluent?

Requests to discharge to sanitary or storm sewer must be directed to the utility owner.

Waste discharges associated with contaminated site remediation generally require site-specific authorization. The requirement for an authorization will depend on the treatment method, contaminant concentrations and disposal location. Authorization is required if the discharge is an "effluent" as defined in the *Environmental Management Act*. A discharge permit may be required where treated water is discharged to the ground. For discharges to the aquatic environment, treated water quality must meet ambient criteria as per the B.C. Water Quality Guidelines and not be an "effluent" for any other reason. Consultation with federal authorities is warranted prior to discharge to an aquatic environment under federal jurisdiction. The ministry's Regional Operations Branch should be contacted regarding requests for authorization to discharge to the environment, which are not associated with contaminated site remediation or are required for an off-site management facility.

9) Who enforces disposal laws?

The Ministry of Environment's regional technical and Conservation Officer Service staff enforce the law and regulations. To report violations and complaints contact the office of the ministry located nearest to you, (see the blue pages of your local telephone directory).

Report all poachers and polluters to the RAPP toll free number: 1-877-952-7277 (RAPP)

10) Is authorization required for a mobile thermal desorption unit? (Hydrocarbon impacted soils are to be fed into super hot chamber where the contaminants are volatilized and incinerated).

Yes, an authorization would be required to operate the unit.

11) Who issues authorizations for effluent discharge at oil and gas drilling exploration or production sites?

Under the Oil and Gas Waste Regulation, the Oil and Gas Commission may issue effluent permits associated with operations and remediation in the oil and gas sector.

Site Investigation and Remediation Process - Independent Remediation

1) What are the advantages and disadvantages of independent remediation?

Advantages: remediation can be carried out independent of ministry oversight and without delays and the requirement to pay ministry fees.

Disadvantages: remediation carried out under independent remediation may not have been vetted by an Approved Professional or ministry staff and may not meet ministry requirements if approval of remediation by the ministry will be required at some time in the future.

2) Is there a minimum volume of soil remediation that triggers requirement for notification?

No. The ministry should be notified of all remediation activities.

3) Do I need to submit a notice of independent remediation completion if I have submitted an application for a certificate of compliance?

Yes, Section 54 (2) (b) of the *Environmental Management Act* states that a notice of completion must be provided to the ministry within 90 days of the completion of independent remediation. There are no exemptions from this requirement.

4) Does the ministry post a list of properties undergoing independent remediation?

When the ministry receives a notification of commencement or completion of independent remediation, that information is added to the Site Registry, which is available to the public. However, we do not post a separate list, although one may be produced for a fee on request.

5) Are notifications of commencement of independent remediation required if a site profile has been submitted for a site?

Yes. No exemptions are provided in the regulation for this situation.

6) Does a local government or contractor require authorization from the ministry to excavate soil in areas known or suspected to be contaminated?

No, such authorization is not required. However, before conducting work on or near sites with a history of activities that may have caused contamination, you should obtain the services of a qualified environmental consultant. If contamination is encountered during excavation you must provide a notification of commencement of independent remediation to the ministry.

7) An environmental consultant hires a company to remove a residential heating oil tank and to manage any incidental waste. Who is responsible for signing and submitting the Notice of Independent Remediation Commencement to the MOE; the environmental consultant taking samples, the land owner or the tank pull/remediation company?

Section 54 (2) of the *Environmental Management Act* states that "Any person undertaking independent remediation... must notify..." Therefore, any of the listed parties may submit this form as they are all involved in the remediation process in some way.

8) If I have reported a spill through the Spill Report Regulation are there any additional reporting requirements under the Contaminated Sites Regulation?

Under the provisions of the provincial contaminated sites legal regime, there is an exemption from the duty to provide to the Director of Waste Management a Notification of Initiation of Independent Remediation when remediation starts in response to a spill reported in accordance with the

requirements of the *Environmental Management Act's* Spill Reporting Regulation. However the Act does require submission of a Notification of Completion of Independent Remediation within 90 days of the cleanup being finished. As well, a Notification of Offsite Migration may need to be submitted to the ministry and owners of affected neighbouring parcels if it is discovered during site investigations or independent remediation that substances are migrating offsite and are likely or actually causing contamination at those neighbouring parcels.

9) The analytical results for soil excavated in conjunction with a residential heating oil tank removal contained petroleum hydrocarbon concentrations below residential standards. However, because the soil was odorous, the soil was shipped to a permitted facility for treatment and disposal. Because no numeric standards were exceeded for the soil do we still have to provide a notice of commencement of independent remediation to the ministry?

[Protocol 16, "Determining the Presence and Mobility of Nonaqueous Phase Liquids and Odorous Substances"](#) indicates that a site is not contaminated with respect to odorous substances if there are no exceedances of the concentrations of substances for the applicable land use in Schedule 11 of the CSR. As long as there were no numerical soil and numerical vapour standards exceeded for the applicable use of the site, a Notification of Initiation of Independent Remediation would not be required. Such a determination would require sampling and analysis of both soil and vapours at the site following ministry requirements and guidance.

10) Do I require authorization to inject chemical or biological agents into the subsurface to help promote degradation of contamination?

It depends. If the release of the substance would qualify as effluent, then an authorization may be needed and the ministry should be contacted for further advice. Effluent is defined in the *Environmental Management Act* as:

"**effluent**" means a substance that is introduced into water or onto land and that

- (a) injures or is capable of injuring the health or safety of a person,
- (b) injures or is capable of injuring property or any life form,
- (c) interferes with or is capable of interfering with visibility,
- (d) interferes with or is capable of interfering with the normal conduct of business,
- (e) causes or is capable of causing material physical discomfort to a person, or
- (f) damages or is capable of damaging the environment;

Site Investigation and Remediation Process - Orders

1) What is a Remediation Order?

The Director of Waste Management may issue a Remediation Order to any responsible person. The Remediation Order may require this person to undertake remediation; contribute towards the costs of remediation; or give security in the amount and form the Director specifies. Further Sources of Information: [Fact Sheet #1](#)

2) Could a Remediation Order be rescinded?

A Director may cancel a Remediation Order.

3) Does the ministry issue many Remediation Orders?

No. Remediation Orders are used infrequently. Remediation Orders are issued only if contamination poses a very high risk to human health or the environment, or the person considered responsible will not agree to responsibility or to carrying out remediation requirements.

4) Can the ministry issue orders other than a Remediation Order?

The ministry may order a site profile, a site investigation or remediation as per the *Environmental Management Act* sections 40, 41 and 48. The ministry also has the ability to make pollution prevention orders, pollution abatement orders under the *Environmental Management Act* sections 81 and 83. We can also impose conditions once we receive a notice of independent remediation under the *Environmental Management Act* section 54(e) (d).

5) Does the ministry have an official document indicating the process used to determine when a remediation order should be issued?

The ministry has not written a specific policy outlining when we would consider issuing a remediation order. However, the ministry typically reserves issuing remediation orders to high-risk sites as a last resort where we have been unable to get the responsible person(s) to undertake the necessary work.

6) Does the ministry maintain a list of the sites where remediation orders have been issued?

The ministry does not keep a complete list of sites subject to remediation orders. A partial list with the Site ID, order number and site address is shown below:

- Site 1397 (OS 15602) 9250 Oak Street, Vancouver
- Site 2203 (OS 15343) 8335 Meadow Ave., Burnaby
- Site 141 (OS 16149) 36001 Galbraith Road, Squamish
- Site 4188 (OE 17312) 510/610 Legion Drive, Quesnel
- Site 5095 (ON 16979) 503 Railway Ave, Salmo
- Site 6675 (OS 16246) 290A Campion St., Kelowna
- Site 5894 (OS 16072) 3607 18th Ave, Prince George
- Site 5263 (OS 15775) 1963 Collison Ave, Masset
- Site 5647 (ON 16050) Sunset Lake Road, Topley
- Site 94 (OS-15012) 2511 No. 5 Rd., Richmond
- Site 4699 (ON-17077) 41st & Collingwood, Vancouver
- Site 405 (OE13637) Goodridge Road, Sooke
- Site 1540 (OE 14296) 25 Braid St., Coquitlam

Site Investigation and Remediation Process - Remediation - General

1) When must remediation be completed?

There is currently no general time limit on remediation; however, in some cases, an Approval in Principle may require remediation to be complete by a certain date. Otherwise, you may want to remediate sooner than later because contaminants can migrate; costs of remediation may increase, money may be lost because you are unable to develop your land; and you are vulnerable to remediation orders, pollution prevention orders and pollution abatement orders.

2) What is remediation?

A general meaning of the term "remediation" would be to clean up a contaminated site so that it meets the environmental quality standards of the Contaminated Sites Regulation. However, there is a legal definition of "remediation" which is much broader and means action to eliminate, limit, correct, counteract, mitigate or remove any contaminant or the adverse effects of the environment or human health of any contaminant, and includes the following:

- a) preliminary site investigations, detailed site investigations, analysis and interpretation, including tests, sampling, surveys, data evaluation, risk assessment and environmental impact assessment;
- b) evaluation of alternative methods of remediation;
- c) preparation of a remediation plan, including a plan for any consequential or associated removal of soil or soil relocation from the site;
- d) implementation of a remediation plan;
- e) monitoring, verification and confirmation of whether the remediation complies with the remediation plan, applicable standards and requirements imposed by a Director;
- f) other activities prescribed by the minister.

3) Does the ministry approve of all remediation techniques?

The *Environmental Management Act* requires that remediation provide permanent solutions to the maximum degree possible taking into account a number of factors. These factors include consideration of the potential for adverse effects on human health or the environment, the technical feasibility and risks associated with the various remedial options, the costs associated with the alternative remediation options, and the potential economic benefits, costs and effects of the remediation options. Proponents responsible for a contaminated site are advised to seek advice on appropriate remedial options from an Approved Professional who has expertise regarding the specific type(s) of contamination present and who is familiar with the provincial legal regime.

Further Sources of Information: [Fact Sheet #30](#)

4) What certification is required when a barrier wall or other engineered works are put in place to prevent recontamination of a site?

Where there is contamination at the boundary of a site and engineered works need to be put in place in order to prevent recontamination, these works should be stamped by an engineer certified to practice in British Columbia. The engineer signing off on the engineered works need not be an Approved Professional.

5) Is a barrier wall or other engineered works required at sites where metal contamination is present on adjacent sites at the property boundary?

If metal or other contamination is shown not to be mobile and there is no significant risk of migration of these contaminants from the source site, there is no need to install engineered works to prevent contamination of neighbouring sites.

6) Substances derived from dense nonaqueous phase liquid (NAPL) chemicals (e.g., dry cleaning solvents) were identified in perched groundwater to a depth of about 4 m at dissolved concentrations greater than the NAPL indicator limits. Substance concentrations in soil and groundwater at a depth greater than 6 m were less than applicable standards and no longer indicative of NAPL presence. The development proposal at the site is to excavate the site to 8 m depth for underground parking and beyond the horizontal limit of identified contamination. Is there a requirement to collect confirmatory groundwater samples from > 8 m following remediation?

Under the circumstances described here (i.e., NAPL presence), a potential does exist for contamination to migrate downward during remediation. Therefore post remediation groundwater sampling would be required.

7) What are ministry requirements for decommissioning boreholes and monitoring wells?

Guidance regarding decommissioning of boreholes and wells drilled for geotechnical purposes is available in the BC Groundwater Regulation at the new GW regulation at:

http://www.bclaws.ca/civix/document/id/complete/statreg/299_2004

8) We propose using monitored natural attenuation of dissolved metals as the preferred remediation strategy at a site. This follows physical removal of an onsite source that created reducing conditions resulting in the elevated metals. Based on post remediation results to date, there is strong reason to believe that the residual dissolved metals will attenuate to within drinking water standards over time (based on other metals rapidly dropping in concentration) and within the five year time allowable for an AiP with a recommendation by an Approved Professional that the AiP be approved by the Director of Waste Management.

Can a Numerical Standards Approved Professional recommend approval of an AiP for a remediation plan that is based upon monitored natural attenuation?

Since the groundwater is to be remediated to applicable standards within 5 years, recommendation of issuance of an AiP by an Approved Professional would be acceptable under Protocol 6, "Eligibility of Applications for Review by Approved Professionals" The recommendation should be accompanied by confirmation that drinking water pathways will be inoperative while substance concentrations in groundwater exceed drinking water standards.

9) Is a covenant on title for a given property considered by the ministry to be an acceptable risk management measure to prevent future drinking water use at a property?

Yes. In general, covenants can be a form of institutional control (defined as a method of controlling the potential for adverse effects on human health or the environment from contamination by imposing legal or administrative requirements that limit the uses at the site or access to the site). Institutional and engineering controls are the two key components of risk management for contaminated sites. A decision to require a covenant would depend on specific features of a site, including its ownership.

Site Investigation and Remediation Process - Site Investigation

1) Does the presence of woodwaste constitute an area of environmental concern? If so, what are the associated potential contaminants of concern?

The site has a Schedule 2 activity - industrial woodwaste disposal. Although the woodwaste may not have been treated with pesticides you might detect non-chlorinated phenols in soil and/or groundwater which are listed in CSR Schedules 4 and 6. It may also be worthwhile to check for metals. A woodwaste landfill would be a contaminated site based on the presence of non-chlorinated phenols.

2) Coal fill material is listed as a predominant contaminant at a site. Should LEPH and HEPH be considered contaminants of concern for the site?

The definition (see Schedule 4 of the CSR) for LEPH and HEPH is for petroleum hydrocarbons so the intent of the parameter would not be to capture coal. Work at other coal impacted sites has shown PAHs and metals to be the predominant contaminants of concern for coal. Acid rock drainage has also

been found in association with coal mining and processing. Typically petroleum hydrocarbons, if present at coal sites, are generally associated with industrial operations surrounding coal production.

3) A service station was decommissioned several years ago and remediation conducted to within a few metres of the property line. No groundwater monitoring was carried out at that time. More recently, groundwater monitoring was carried out at the property line which indicated that groundwater quality at that point met appropriate standards. Would the ministry require additional groundwater assessment down gradient of the site?

Yes. Assessment down gradient of the site for contamination originating from the service station is necessary.

The ministry expects that contamination from a source site to be fully delineated. In this circumstance, it needs to be confirmed that there is no contamination that has migrated from the source site. To sample groundwater only on the source site would demonstrate only that the groundwater in the backfilled material is clean; that the cleanup at the source site has been successful; and that there is no ongoing source or recontamination. However, such a limited site investigation would not rule out any remaining down gradient offsite contamination.

4) The definition of a preferential flow pathway in Protocol 7 indicates that one has to calculate the groundwater flow velocity in a potential preferential pathway in order to determine whether it is defined as a preferential flow pathway. My understanding of the current ministry guidance on calculating velocities in pathways is to calculate hydraulic gradients and conductivities within pathways. This requires installation of monitoring wells within potential pathways and water level monitoring (for calculation of hydraulic gradients) and well response tests (for calculation of hydraulic conductivities). Is my understanding correct of the level of investigation that is required or is a qualitative approach also acceptable?

Where groundwater contamination is significant and there is a reasonable possibility that groundwater could migrate along a preferential pathway to a receptor in less than 50 years (for aquatic life water use) or 100 years (for drinking water, irrigation or livestock watering uses), appropriate hydrogeochemical information should be obtained. However, where groundwater contamination is marginal (less than 10% in excess of the standards) and migration distances along preferential pathways are large (greater than 500 metres), a more qualitative assessment may be acceptable.

There are many possibilities that exist between these two requirements that would influence the extent of investigative effort. In addition to issues of significance of contamination and likelihood of transport there are issues of technical difficulty and risk of working around underground utilities. All of these have to be considered when making decisions about the type and extent of intrusive investigations to be conducted around preferential pathways.

As a result, the ministry has not developed prescriptive guidance for groundwater and preferential pathway investigations. Rather, environmental professionals familiar with the details of the site are best positioned to make decisions most appropriate for the conditions of their site. However, the professional remains responsible for defending their decision based on factual information, lines of evidence and proper scientific analysis and interpretation.

It is not mandatory to install a well in sewer backfill, to measure water levels within the utility corridor or to conduct rigorous tests to determine hydraulic conductivity. However, professionals do need to know where utilities are located, where the point of discharge to surface is, and the utility invert and preferably backfill invert elevations. Also, environmental professionals should have a good appreciation of if, and for how long (temporarily), the regional water table intersects the utility corridor and the approximate gradient of the submerged portion. The water level of the surrounding aquifer at a site can be predicted from wells nearest the utility and reasonable assumptions about the gradient between the site and the receptor (from utility plans and topographic maps). Professionals can also do a grain size determination of the backfill or assume a composition of pea gravel or coarse sand and calculate a hydraulic conductivity value from empirical equations.

If the predicted pathway of the groundwater plume doesn't reach a receptor and does not move beyond the property line of the site and onto a neighbouring property, professionals should conduct sufficient investigations to verify that contamination has not migrated offsite.

Other supporting lines of evidence that might be presented in a preferential pathway assessment, particularly where a more qualitative approach has been taken, include the time frame over which the contamination has existed on site, whether the source has been removed, chemical characteristics of the contaminant that affect transport and any trends data showing a stable or shrinking groundwater plume. These supporting factors are not considered in Protocol 7 but would lend strength to conclusions where preferential pathways have been discounted.

As supplemental information, a definition of preferential flow pathways is also included in [Protocol 13 \(Screening Level Risk Assessment\)](#).

5) At our site, the contaminant plume has not intercepted a preferential flow pathway but may intercept a preferential flow pathway within a 50 year travel time. In order to

determine whether aquatic life standards apply, are we required to assess existing preferential flow pathways or prospective pathways as well?

It depends on site-specific considerations. An approach that conforms to the intent of Protocol 7 would require calculation of the travel time through the aquifer to the pathway and then through the pathway to the receptor. On this basis, environmental professionals would have to consider both current and predicatively intersected preferential flow pathways. However, the effort one puts into the assessment again must be evaluated with respect to the significance of the problem and the likelihood of transport to and along the pathway. A similar approach to the response outlined in the previous question would be reasonable.

6) A previous consultant conducted remediation of resin that was visible in shallow soils. The chemicals used to make the resin are phenol and formaldehyde. The previous consultant cleaned up the visible resin and did confirmatory sampling but did not find phenols or formaldehyde above standards in any of the tested samples. An engineering firm took some samples for phenols and formaldehyde but the results did not exceed standards. Is it acceptable to not list phenol and formaldehyde as contaminants of concern because they have not been found in concentrations above standards at the site?

The situation you describe is one where the resin material removed from the site had visual properties which made its removal an easy process. While the resin's composition is known from the manufacturer's information, the specific constituent substances were never detected in confirmatory samples from the site. In the current situation, for completeness, remediation undertaken was confirmed using phenol and formaldehyde. Therefore, it would be preferable to list phenol and formaldehyde as contaminants of concern.

7) If asphalt is identified as a waste in soil, when are pieces of asphalt to be included or excluded from samples submitted for analysis?

As most modern asphalt exists as a vitrified solid, the ministry has advised that pieces of asphalt greater than 2 mm should not be included in "soil" samples. The less than 2 mm fraction is consistent with that used to define "soil" under the ministry's strong acid leachable metals (SALM) in soil analytical methodology.

8) I have a question about the quality assurance / quality control) (QA/QC) requirement for field samples that the relative percent difference (RPD) should be $\leq 20\%$, and the practical quantification limit (PQL) should be >5 times the method detection limit (MDL) for both samples (parent and duplicate). The only reference I can find for the RPD in Land Remediation Section guidance is in Technical Guidance 1, where it is presented in the context of stockpile sampling. I can't find any reference for the PQL in the Contaminated Sites Regulation's materials. The best reference I can find in general is the BC Field Sampling Manual (2003), where it states:

It should be expected that the RPD is somewhat greater than that for laboratory duplicates. If one of a set of duplicate values at or greater than five times the MDL, then RPD values $>20\%$ indicate a possible problem, and $> 50\%$ indicate a definite problem, most likely either contamination or lack of sample representativeness.

Is this the source of the criteria? If so, then does the ministry explicitly endorse these criteria; or does it prefer the 20% limit, or are there no preferred values?

The two QA/QC criteria you mention (QC criteria for field samples is that the RPD should be $\leq 20\%$, and the PQL should be > 5 times the MDL for both samples (parent and duplicate) are very commonly used in contaminated site characterization/investigation.

You are correct that the 2003 BC Field Sampling Manual, Appendix 3 "Field Duplicates/Replicates" is the source for the RPD criterion $\leq 20\%$ which actually represents the more conservative end of the BC Field Sampling manual's "acceptable range" for RPD (i.e., 20 to 50%).

The PQL criterion > 5 times the MDL for both samples (parent and duplicate) is based on now repealed advice formerly provided by the ministry in Technical Guidance 18. Originally, Technical Guidance 18 dealt with non-scheduled toxic substances (NSTS) and indicated that a site was not a contaminated site if the soil or water at the site did not contain a NSTS in excess of the PQL for the substance. The PQL was defined in Technical Guidance 18 as 5 times the MDL for the substance. With the repeal of the NSTS process and inclusion of Schedule 10 in the CSR, this PQL criterion serves no QA/QC purpose, other than providing an indication of common "routinely achievable" analytical method ability across different laboratories within the Province.

The ministry would usually endorse use of the RPD $< 20\%$ limit as an estimate indicating acceptable QA/QC for field duplicates in contaminated site characterization. However, it is important to note that this criterion is provided as an example of an appropriate QA/QC DQO (data quality objective) for use as a component of a QA/QC program as described in the 2003 BC Field Sampling Manual and the 2009 BC Environmental Laboratory Manual (for laboratory analyses).

The ministry requires only that an adequate and representative DQO-based QA/QC program subject to performance audit be developed and followed for site characterization and investigation.

9) Regarding Part II (Batch Testing of Suspect Material in Stockpiles) of Technical Guidance 1, must these guidelines be followed exactly when characterizing stockpiled soil to be disposed of offsite?

Technical Guidance 1, "Site Characterization and Confirmation Testing" is recommended guidance, not mandatory. If stockpiled soil is being disposed offsite to a permitted disposal facility, sampling needs to be completed to ensure the material is of suitable quality under the authorization for that facility. Disposal facilities generally have their own requirements for materials classification and, depending on what they are, they may be sufficient to satisfy the ministry's requirements that soils be disposed at an "appropriate facility." If soils are to be disposed offsite under a Contaminated Soil Relocation Agreement (i.e., not at a facility operating under a permit or other authorization under the Environmental Management Act) or are to be re-used onsite (such as in the case of bioremediated soils) stockpile sampling more in line with Technical Guidance 1 would be expected. That guidance makes allowance under Part II for the use of alternative approaches. These approaches "must be based on sound statistical principles, be appropriate to the method of excavation employed, and be capable of being validated at a level of certainty acceptable to the ministry. Technical Guidance 2 provides guidance on the use of statistics to characterize a volume of soil.

10) I'm working on a site where I want to use statistical analyses to evaluate my soil data. I've been using US Environmental Protection Agency's ProUCL Version 4.00.02 program to calculate my 90th percentiles and 95% upper confidence limits, and I wanted to confirm whether the ministry recognizes and accepts the evaluation methods used in this program.

EPA's ProUCL program is an Excel based statistical package program which can be used to do many of the statistical calculations described in Technical Guidance 12, Statistics for Contaminated Sites." ProUCL may be used to do the basic descriptive calculations (i.e., mean, 90th percentiles, 95th confidence limits) or even more sophisticated calculations (e.g. ANOVA, t-tests) required for statistical analysis provided you use the statistical formulas and methods described in Technical Guidance 12.

Site Investigation and Remediation Process - Site Profiles

1) A Schedule 2 activity is present on one portion of a large site with a single legal land description. A "yes" answer has been provided due to a separate activity elsewhere on the site. Am I required to submit a site profile?

Yes, the legislation is written such that the ministry makes a decision for the entire parcel, so information in the site profile would take into account all activities over the entire parcel.

2) Are site profiles required when a local government permit is required on First Nations' land?

Currently, most reserve land is under Federal jurisdiction and most requirements under the *Environmental Management Act* would not apply, including the requirement to submit a site profile. However, as treaties are established between bands and the Provincial Government, the provisions under EMA may apply. We expect that many First Nations will operate in a similar fashion to other local governments and will have to choose whether to opt out of the site profile process.

3) If a closure plan approved by the Ministry of Environment exists for a landfill, do I have to complete a site profile?

Landfilling of wastes is a Contaminated Sites Regulation Schedule 2 activity. When the landfill, permitted or not, no longer accepts waste this is considered decommissioning. At that time the owner or operator is required to submit a site profile directly to the ministry. Any landfill that has closed since April 1, 1997 should submit a site profile to the ministry advising of decommissioning, if they have not already done so.

4) Can a former landfill be redeveloped based on an approved closure plan?

The approval of a closure plan does not exempt the property owner from the duty to submit a site profile nor does it release a local government to issue an authorization, such as a development permit, specified in section 40(1) of EMA.

The ministry recommends that landfill closure and site remediation professionals work together to gather information that will satisfy both landfill closure plan requirements and a Certificate of Compliance for the site.

5) Are residential properties exempt from the requirement to submit a site profile?

No. Contamination migrating onto a residential property is a Schedule 2 activity for the residential property and can trigger the duty to submit a site profile. Other circumstances where a site profile is required for a residential property are the operation of an illegal drug lab or a commercial operation such as small engine or vehicle repair, paint shop, welding shop or other activity specified in the regulation.

6) There are a number of historic site profile decisions that were issued by the Ministry of Environment for oil and gas sites which do not reflect the current decision making process followed by the Oil and Gas Commission. Are these decisions to stand?

It is currently the ministry's policy to refer old site profiles for which ministry previously determined "investigations required" to the Oil and Gas Commission for an updated decision on whether investigations are required under the new Memorandum of Understanding between the ministry and Commission to manage the Certificate of Restoration process.

7) An unauthorized wood waste landfill operated on our property. Does this constitute a Contaminated Sites Regulation Schedule 2 activity?

Yes. Any activity identified in CSR Schedule 2 (e.g., item H13, industrial woodwaste (log yard waste, hogfuel) disposal), whether legal or illegal would trigger the requirement for completing a site profile in advance of decommissioning or at the time of application for an approval described in section 40 of the *Environmental Management Act* (e.g., development permit, subdivision, etc.).

Site Investigation and Remediation Process - Site Risk Classification

1) Am I required to submit a Site Risk Classification Report with an application for a Determination that a site is NOT contaminated?

Protocol 12 states that a Site Risk Classification Report shall accompany all site investigation reports submitted to the ministry as part of a site services application. However, if a site qualifies for a determination the site is NOT contaminated, it is by definition not a high risk site. Therefore, a Site Risk Classification Report does not need to accompany these applications.

2) Does a Site Risk Classification Report need to be submitted with an application for a Contaminated Soil Relocation Agreement?

If the soil for which a Contaminated Soil Relocation Agreement is being sought and the ministry has not previously received a Site Risk Classification Report for the source site, a Site Risk Classification Report must be submitted with the Contaminated Soil Relocation Agreement.

If the ministry has already received a Site Risk Classification Report for the source site (for example, when one has been submitted with a Notification of Independent Remediation for the site), a Site Risk Classification Report does not need to be submitted with the Contaminated Soil Relocation Agreement.

3) What is the correct reclassification for a site initially classified as a “high risk site” but subsequently found to be in compliance with the risk-based standards of the Regulation?

A site at which mobile nonaqueous phase liquid is present or at which an exceedance of an applicable upper cap concentration coupled with a complete exposure pathway exists is initially classified as a “high risk site” under Protocol 12.

If a subsequent detailed human health and ecological risk assessment performed for the site confirms that the site meets the risk-based standards of the Regulation without the need for any exposure pathway controls, that site would be reclassified as “non-high risk site” for the purposes of Protocol 12.

If a subsequent detailed risk assessment performed for the site determines that exposure pathway controls are required to satisfy the risk-based standards of the Regulation and the exposure pathway controls are implemented and maintained in a manner acceptable to the ministry, the site would be reclassified as a “risk managed high risk site” under Protocol 12.

4) Does a Site Risk Classification Report need to be submitted with an application for a determination of background substance concentrations?

Yes, if the site risk classification has not yet been established.

5) What does the ministry consider to be “sufficient site investigation” required to complete a Site Risk Classification Report?

The site risk classification conditions of Protocol 12 comprise simple, facts-based criteria intended to allow classifications to be made on the basis of limited, readily obtainable and routinely collected data in contaminated site investigations. However, the protocol recognizes that there will be more known about sites with respect to some notification triggers than others. For example, site information at the time of a contaminated sites service application would likely be much more comprehensive and complete than that known about an offsite affected property at the time of submitting a Notification of Likely or Actual Offsite Migration.

If investigations have delineated all nonaqueous phase liquids and all upper cap concentration exceedances outside of distance criteria and below depth and area criteria in the exposure pathway assessment, no further investigation is required to complete the Site Risk Classification Report. Where site investigations are incomplete or insufficient to determine if one or more of the eight exposure pathways is complete at the time a Site Risk Classification Report must be submitted, you must indicate that further investigations are required and the scheduled completion dates for those further investigations in Part 3, Section V of the Site Risk Classification Report.

Where high risk conditions are being remediated under independent remediation in less than 90 days, further site investigations to allow proper completion of the Site Risk Classification Report are not required.

Regardless of the quality and completeness of available site information at the time of submission of the Site Risk Classification Report, where high risk conditions have been identified at a site, they must be indicated on the Report.

Note: additional investigations may be required to support site closure under the Regulation by way of a Notification of Completion of Independent Remediation or Certificate of Compliance.

6) Are there circumstances when soil vapour and groundwater investigations are not required when determining site risk classification?

If based on available site information and in the opinion of a qualified professional the Site Risk Classification Report can be adequately and satisfactorily completed in the absence of investigations of one or more environmental media, the Report can be completed. However, rationale must be provided to clearly support and document the determination of no upper cap concentrations present in the media lacking data. Note that Site Risk Classification Reports are subject to audit.

7) Does a Site Risk Classification Report need to be submitted if the site has already been classified?

If a completed Site Risk Classification Report has already been submitted to the ministry for the site in question, and the classification is unchanged at the time the contaminated sites service application is submitted, a new Report need not be submitted with the service application. However, if the original Site Risk Classification Report was incomplete at the time of submission, a new Report must be submitted with the service application.

Once a site is classified as high risk or non-high risk, investigation reports do not need to be accompanied by a Site Risk Classification Report unless the investigation report is for the purpose of requesting a change to the site risk classification.

8) Is there a list of other exemptions, not indicated above, where a Site Risk Classification will not be required?

Yes, the following exemptions to the requirement for submitting a Site Risk Classification Report with a Notification of Independent Remediation apply.

Soil Quantity Exemption

A person undertaking independent remediation is not required to submit a Site Risk Classification report if the quantity of soil to be remediated does not exceed 5 cubic metres in volume.

Certificate of Compliance - numerical standards exemption

If a Notification of Initiation of Independent Remediation has been submitted to the Director for a site and the Director has received an application for a Certificate of Compliance for the site within 90 days of completion of independent remediation at the site confirming compliance with the numerical standards, a person undertaking independent remediation is not required to submit a Site Risk Classification Report.

Residential underground heating oil storage tank exemption

A person undertaking independent remediation at a site meeting the criteria below is not required to submit a Site Risk Classification Report.

This exemption applies only to independent remediation at sites:

- a. where the person has no duty to submit a Notification of Offsite Migration associated with the independent remediation of contamination at the site under subsection 57 (1) of the Regulation;

- b. where the contamination is limited solely to petroleum hydrocarbons in residential heating oil;
- c. which are not high risk sites;
- d. which land is being used for residential land use; and
- e. where an underground heating oil storage tank with a volume less than or equal to 2,500 litres has been or will be removed.

Spill reporting exemption

Under Protocol 12, a person is not required to submit site risk classification information at the initiation of independent remediation of a spill, whether or not the spill is or was reportable under the Spill Reporting Regulation.

In addition, under this Protocol a person undertaking independent remediation of a spill is not required to submit a Site Risk Classification Report if:

Remediation of the spill site is completed within 30 days of the occurrence of the spill and sampling and testing results indicate the site is no longer contaminated, or

Any of the following criteria and conditions are met:

- a. The spill is not reportable under the Spill Reporting Regulation;
- b. The quantity of soil which has been remediated does not exceed 10 cubic metres in volume;
- c. Spilled substances are not listed in Schedules 4, 5, 6, 9, 10, or 11 of the Regulation the Regulation (for example, asbestos, canola oil);
- d. Environmental quality standards do not appear in Schedules 4, 5, 6, 9, 10, or 11 of the Regulation for any current or reasonably anticipated future uses of lands at and adjacent to the location of the spill;
- e. The spill has been entirely contained in a spill containment system designed, maintained and operated to contain spills at the spill site;
- f. The spill has not or would not be reasonably expected to contaminate lands, water, or sediments under Provincial jurisdiction because the spill has occurred to marine waters or other areas under Federal jurisdiction;
- g. The Director has received an application for a Certificate of Compliance within 90 days of completion of independent remediation at the spill site.

These exemptions do not apply:

- a. where a Notification of Likely or Actual Offsite Migration is required to be submitted, and
- b. to legal parcels with multiple areas of potential environmental concern that are known or are

likely to have high risk conditions.

9) In the Exposure Pathways Questionnaire of Protocol 12, Site Risk Classification, under "Human Health Exposure – Soil vapour exposure" pathway, there is a note #7 beside pathway HV-1. Note #7 indicates that where concentrations occur above upper cap concentrations (UC), cross-sections are required to report conclusions that UC contamination is located at depths greater than 1 m below soil surface. Are cross sections required when vapour assessment is required?

Cross-sections must be included in a detailed site investigation. Therefore, if vapours exceeding upper cap concentrations are present, there must be a source of these vapours in soil or groundwater even if that source itself does not exceed upper cap concentrations. Thus, the depth to the vapour source should be included in a drawing.

10) What are the requirements for submitting Site Risk Classification Reports and Notices of Independent Remediation to the ministry (MOE) and the Oil and Gas Commission (OGC) when remediation is carried out at an oil and gas drilling site? Currently, we are sending both the OGC and MOE "notices of independent remediation" for onsite remediation to address small exceedances around wells. However, when I read Protocol 12, it seems that note 1 under Table 1 outlines that notification to the MOE under these specific circumstances is not required.

In Protocol 12, footnote 1 of Table 1 pertains to the submission of Site Risk Classification Reports (SRCR) only. Notifications of Independent Remediation (NIR) are a requirement under the Contaminated Sites Regulation and are not affected by Protocol 12 (P12). Footnote 1 turns off the requirement for submission of a SRCR at the time a NIR is submitted to the MOE for upstream oil and gas sites. All oil and gas sites undergoing independent remediation must complete and submit an OGC Site Classification Tool. Depending on the site classification determined here a Site Risk Classification Report may also be required.

Here are the steps for an oil and gas site:

- NIR sent to MOE (per CSR requires), copy sent to OGC
- NIR sent to MOE indicates IR site is an oil and gas site and confirms the OGC Site Class report was concurrently submitted to OGC (but does not include the SCR)
- OGC Site Classification report accompanies copy of NIR to OGC,

- OGC reviews report and advises MOE of the classification of the IR site (non-priority sites stay with OGC, priority sites proceed through P12 process and come to MOE)

Vapour Investigation and Remediation – General Technical Guidance

1) What are the vapour assessment requirements for wildlands sites?

Consultants are not required to characterize vapour contamination when conducting site investigations at wildlands sites since there are no Schedule 11 standards for wildlands land use. However, consultants are required to assess human health vapour exposure risks at wildlands sites when conducting a risk assessment.

2) In Technical Guidance 4 it states that the vapour refinement step will only be allowed for gasoline and diesel sources. Is it anticipated that other petroleum fuel sources be included at a future date (specifically, Bunker C oil)? What about coal?

Version 1 of Technical Guidance 4 only allows the vapour refinement step for substances listed in Table 1 of that document. If potential contaminants of concern not listed in Table 1 are identified in the hydrocarbon mixture, they would need to be investigated in soil vapour. The reason that the refinement step was limited to the substances listed in Table 1 is that when modelling vapour concentrations from analytical detection limits in soil and groundwater, exceedances of standards are predicted for a wide variety of substances listed in Schedule 11 of the CSR. It was concluded that if concentrations of these substances in soil and groundwater are below their method detection limits, that does not necessarily indicate that vapour contamination is not present; and therefore, vapour investigation should occur.

3) I understand that Technical Guidance 4 was effective September 1, 2010. Can the (new) attenuation factors be applied to previous analytical results?

When Technical Guidance 4, "Vapour Investigation and Remediation" (Version 1), was finalized, those performing vapour assessments were provided several months before the provisions in the guidance came completely into effect.

Vapour assessments received by the ministry before February 1, 2011 could be completed in accordance with either this document or the July 2009 version of draft Technical Guidance 4. Vapour

assessments by the ministry received on or after February 1, 2011 were expected to be completed in accordance with version 1 of the document.

4) The draft Technical Guidance 4 provided specific guidance for attenuation factors relating to shallow sub-asphalt vapour samples (i.e. exterior "sub-slab") as 0.01. However, the new version does not directly address the issue of exterior sub-asphalt attenuation factors.

With the technical guidance document there is list of references. Reference document 3 suggests that 0.02 may be an appropriate attenuation factor to use in the above scenario. However, Table 2 in Technical Guidance 4 suggests that an attenuation factor of .0001 should be used if the sample is considered to be a subsurface sample collected from < 1 m depth.

Can you tell me which attenuation factor to use for this scenario?

If the soil vapour data is used to predict indoor air concentrations in a future building, an attenuation factor of 0.02 should be used, on the other hand, if development of the site is unlikely (e.g., it is a road) and the receptor of concern is an outdoor air breather, you could apply the attenuation factor of 0.0001 indicated in Table 2 of Technical Guidance 4.

Both of these answers presupposes that all samples are representative of shallow soil vapours and all appropriate QA/QC (e.g., leak testing) measures were conducted to demonstrate this.

5) The outdoor attenuation factors in the September 2010 version of Technical Guidance 4 are an order of magnitude lower than in the previous draft version of the document. Please explain the reason for the change.

The attenuation factors in the draft version of the document were calculated based on soil saturation limits but the calculated outdoor air concentrations were not. So for concentrations above the soil saturation limit, attenuation factors increased rather than staying constant. This added an extra level of conservatism which was likely not warranted, and therefore the outdoor air a values were amended in final document.

6) In Technical Guidance 4 it states that we can assess vapour PCOC's utilizing soil and groundwater samples from the site using partitioning equations in Exhibit 2 of reference 4. What equation do I use to apply attenuation factors to outdoor scenarios (e.g. oil & gas drilling sites)?

The partitioning equations in the referenced Health Canada guidance are intended to estimate vapour concentrations near the source in the subsurface. Technical Guidance 4, "Vapour Investigation and Remediation" indicates that after soil vapour concentrations have been estimated, an environmental consultant may apply the appropriate ministry vapour attenuation factor from Table 2 of the guidance to predict vapour concentrations in the breathing zone (attenuation factors for outdoor exposure are provided in Table 2).

7) Attenuation factors are not allowed when there is "active pumping or drawdown of groundwater at the site" according to TG4 Table 2, footnote 1.

a. Is the intent of the exclusion of pumping stated in TG4 Table 2 footnote 1 to include areas where a sump pump is necessary for parts of the year, or all of the year?

b. If so, clarify the rationale of this exclusion of sump pump pumping.

Yes, the footnote excludes sites where the groundwater table is depressed, and groundwater pooling in a sump is pumped into the storm or sanitary sewer systems.

The rationale is as follows:

- i. In the event of sump failure, contaminated groundwater may pool inside a building, and present a direct source of contaminated vapour in a indoor breathing zone.
- ii. Building sumps are generally unsealed and therefore present a preferential pathway for vapour intrusion into a building.

Vapour Investigation and Remediation - Refining the list of vapour PCOCs

1) At one of our APECs, VPHv was identified as a vapour PCOC. After thorough investigation of the soil and water at this APEC, we found no detectable concentrations of VPHs or VPHw, but we did find detectable concentrations of LEPHs and LEPHw. Given this, are we required to retain VPHv as a vapour PCOC for this APEC?

No. If you do not detect VPHs or VPHw in soil or water at your APEC, then you do not need to retain VPHv as a vapour PCOC for that APEC (i.e., you do not have to analyze vapour for VPHv), even if you do detect LEPHs or LEPHw. Note that this question arises because VPHv includes the C6-13 carbon range, while VPHs/w includes the C6-10 carbon range and LEPHs/w includes the C10-19 carbon range. So, screening out VPHv as a vapour PCOC where LEPHs/w is detected in soil/water equates to ignoring

the potential vapour risks associated with the C10-13 range of LEPHs/w. Based on information currently available to the ministry, the C10-13 fraction of VPHv is generally a minor contributor to the overall toxicity of VPHv. As a result, the ministry considers the potential vapour risks associated with the C10-13 fraction of LEPHs/w to be quite small, and thus the elimination of VPHv as a vapour PCOC where VPHs and VPHw are not detectable in soil or water is considered defensible. Note also that elimination of VPHv as a vapour PCOC where VPHs/w is not detectable but LEPHs/w is detectable is optional — for completeness, one may want to retain VPHv as a vapour PCOC under these conditions.

2) I do not have soil data for one of my gasoline PCOCs. Can I remove this substance from my vapour PCOC list without this data?

No. If you do not have soil, sediment (if applicable), and water data for a particular vapour PCOC, then you cannot complete the vapour PCOC refinement step for that substance — you will have to retain that substance as a vapour PCOC for the APEC.

3) At my site, there are no detectable vapour PCOCs in soil, sediment, or water, but the soil is emitting a petroleum hydrocarbon odour. Is it acceptable to remove, from my vapour PCOC list, the gasoline and diesel PCOCs which are non-detectable in soil, sediment, and water?

No. Regardless of the analytical chemistry results for soil, sediment, and groundwater, the vapour PCOC refinement step cannot be applied if other evidence (e.g., odours, staining) suggests a vapour source is present in soil, sediment, or water. In this situation, retain all vapour PCOCs that could be causing the odour.

4) At my site, there are no detectable vapour PCOCs in soil, sediment, or water, but the concentrations of some substances exceed Schedule 11 in the breathing zone (i.e., after the application of the appropriate Table 2 vapour attenuation factor). Is it acceptable to remove from the vapour PCOC list the gasoline and diesel component substances which exceed Schedule 11 but are non-detectable in soil, sediment, and water?

If you have soil, sediment, and water data which indicate that a given vapour PCOC is not detectable in these media, but vapour data which indicate that the given vapour PCOC exceeds Schedule 11 in the breathing zone, then you should revisit your conceptual site model and your soil, sediment, and water characterization results to identify the source of the vapour PCOC in question before proceeding

with this refinement step. If the source of the vapour PCOC in question is not soil, sediment, or water, or the vapour PCOC in question is associated with an activity not listed in Schedule 2, then removal of this substance from the vapour PCOC list is acceptable. The rationale and evidence for PCOC removal must be included in your investigation document. If the source of the vapour PCOC in question is in soil, sediment, or water and the Schedule 11 exceedance is associated with an activity listed in Schedule 2, then removal of this substance from the vapour PCOC list is not acceptable. When in doubt, retain the substance as a vapour PCOC.

5) Is the ministry considering including jet fuel and kerosene in Technical Guidance 4 as eligible compounds for the "Potential Contaminant of Concern (PCOC) Refinement" step? They are very similar to diesel, which is included in the document. Also, I presume the reference to gasoline includes both automobile fuel (mogas) and jet fuel (avgas)?

At this time ministry is not considering adding potential contaminants of concern (PCOC) lists for other types of hydrocarbon containing sites to Technical Guidance 4. (Note that the PCOC refining step for components of gasoline and diesel in Technical Guidance 4 is only for substances listed in Table 1 of that document.) Nevertheless, if you can demonstrate that the mixture of jet fuel (or other hydrocarbon) is comprised only of substances listed in Table 1, and which are not detectable in soil or groundwater, you should be able to complete the refinements step as per Technical Guidance 4. If, however, there are other PCOCs related to jet fuel that are not included in Table 1, these would need to be investigated in soil vapour.

The reference to "gasoline" in Technical Guidance 4 is for gasoline that would be used in a typical automobile (mogas). In order to perform the PCOC refinement step for "other" mixtures of hydrocarbons (i.e., aviation fuel or avgas) an applicant would need to demonstrate that PCOCs related to the "other" mixture contain only substances listed in Table 1 of Technical Guidance 4.

Vapour Investigation and Remediation - Characterizing vapour contamination

1) If the detection limits and analytical methods of a mobile laboratory are the same as those of its Canadian Association for Laboratory Accreditation (CALA) certified, fixed parent laboratory, do the mobile laboratory detection limits meet the Technical Guidance 4 definition of detection limit?

Yes. Note that neither the parent laboratory nor the mobile laboratory actually has to be CALA-certified for the particular analyte of concern. The Environmental Data Quality Regulation allows the

Director to request that environmental samples be analyzed for “designated characteristics” at a CALA registered laboratory. Designated characteristics mean characteristics, analytes, or parameters designated for inclusion in a CALA inter-laboratory quality assurance / quality control (QA/QC) comparison program. Typically, the Director would only request analyses for designated characteristics where the results would constitute legal samples for use in legal proceedings under the *Environmental Management Act* in a court of law. For most regulatory purposes (e.g., assessment/ confirmatory samples under the Contaminated Sites Regulation), the Director simply requires that the laboratory be CALA-certified for one or more of the analytes or services that the lab offers. Basically, CALA certification shows that the lab is cognizant of proper QA/QC procedures and is participating in at least one formal CALA inter-laboratory QA/QC comparative program.

2) Can we use vapour data collected from groundwater monitoring wells to characterize vapour contamination at our site?

Yes, but there is a scarcity of guidance on vapour sampling from groundwater wells. So if you take this approach, provide a detailed description and diagram of your sampling apparatus, and thoroughly defend the representativeness of the data collected.

3) A vapour PCOC source in groundwater originates at my property and extends onto a neighbouring property. The concentration of the source decreases as it moves offsite. The neighbouring property has a residence with a basement. See the attached Figure A for an illustration. Where should I collect vapour samples and what vapour attenuation factor should I choose to estimate the vapour PCOC concentration in the offsite residence? Note that I would prefer not to collect vapour samples offsite.

Refer to the attached Figure B and the following discussion for guidance on estimating the vapour PCOC concentration in the offsite residence. You could begin by placing a well close to the source over the area with the highest source concentration (Well 1). This is a conservative approach but not a waste of time since the data would be needed to estimate any indoor or outdoor exposure onsite. Base the choice of vapour attenuation factor from Table 2 on the vertical distance between the bottom of the bentonite seal in your well and the bottom of the offsite building foundation (you essentially assume the offsite building lies directly above the vapour sampling location). In your case the distance is approximately 7.0 m, which equates to a Table 2 attenuation factor of 8.3×10^{-4} . Multiply this attenuation factor by the vapour PCOC concentration from Well 1 to estimate the vapour PCOC concentration in the offsite building. If the estimated vapour PCOC concentration in the offsite building is equal to or less than Schedule 11, then you can be reasonably confident that there is no vapour

contamination in the offsite building associated with the vapour source on your site. If the estimated vapour PCOC concentration in the offsite building exceeds the Schedule 11 value, then refine your estimate by taking an additional sample close to the source and near the edge of your property (Well 2) and following the same steps as for Well 1. If the estimated vapour PCOC concentration in the offsite building still exceeds Schedule 11, then proceed with sampling closer and closer to the property. Depending on the results of additional subsurface samples, you may need to progress to subslab and indoor vapour sampling.

Note the following simplifying assumptions made in the answering of this question:

- The vapour source is stable or shrinking.
- The vapour plume is stable or shrinking at the location where the vapour samples were taken.
- Substance concentrations in vapour at the sampling locations are representative of (i.e., equal to or greater than) substance concentrations in vapour at the same depth beneath the offsite building.
- A sufficient number of spatial samples and sampling events were conducted.
- The water table doesn't fluctuate.
- The water table elevation is the same at the sampling location and offsite building location.
- Site conditions do not preclude the use of the Table 2 vapour attenuation factor used.

Further Sources of Information - Figures A & B

4) At my site, there is a shallow vapour source in soil adjacent to the excavation footprint of a future building. Refer to the attached Figure C for an illustration. I want to determine, for characterization purposes, whether there will be any vapour contamination in the future building associated with the adjacent vapour source in soil. Is it acceptable to collect a vapour sample between the vapour source and the side wall of the future building (close to the source and approximately 2 m from the building wall – see figure) and apply the subslab vapour attenuation factor of 0.02 to estimate vapour PCOC concentrations in the future building? I know 0.02 is a vertical attenuation factor, but its use in this case seems conservative since vapour from the vapour source is most likely to migrate up towards the surface rather than laterally through the building side wall.

Yes, the ministry accepts the use of a 0.02 vapour attenuation factor for characterization purposes at this site. The ministry agrees that this will provide a conservative estimate of vapour PCOC concentrations in the building associated with the adjacent shallow vapour source.

Note the following simplifying assumption made in the answering this question:

- The vapour source is stable or shrinking.
- The vapour plume is stable or shrinking at the location where the vapour samples were taken.
- A sufficient number of spatial samples and sampling events were conducted.
- Site conditions do not preclude the use of the Table 2 vapour attenuation factor used.
- There is no vapour source in groundwater.

Further Sources of Information - Figure C

5) Our site has a potential contaminant of concern (PCOC) which is listed on in Contaminated Sites Regulation Schedule 11. Unfortunately, there are no acceptable methods provided in the BC Lab Manual for determining the PCOC's presence in water or soil. What is an acceptable process for assessing such a chemical compounds?

Where a vapour sample cannot be obtained and an official lab manual soil or water method for the vapour PCOC is lacking, the Director will accept for soil and water:

- analytical results for the PCOC obtained by a laboratory's use of an analytical method approved by some other agency (e.g., US Environmental Protection Agency, Environment Canada, Canadian Council of Ministers of the Environment, etc.) or,
- analytical results for the PCOC obtained by an analytical method developed *de novo* by a laboratory,

provided the laboratory conducting another agency's method or developing their own method is CAEAL (now Canadian Association for Laboratory Accreditation - CALA) registered in accordance with the Environmental Data Quality Assurance Regulation under the *Environmental Management Act*

http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/22_301_90

6) Under the current Technical Guidance 4, can the partitioning equations be used to predict vapour concentrations from soil concentration data for substances with a liquid with specific gravity greater than 1?

The current version of the guidance recommends that the equations not be used under those circumstances, however, on sites that have been thoroughly characterized, and determined to be free of any dense nonaqueous phase liquids (DNAPLs), environmental consultants may use the partitioning equations from Health Canada (2008) to estimate soil vapour concentrations.

It is important to stress that DNAPLs are difficult to characterize, and therefore vapour arising from DNAPLs can also be difficult to characterize through modelling alone; therefore, investigators and reviewers should be very confident that DNAPLs are not present before proceeding in this manner.

7) Draft Technical Guidance 4 allowed the use of groundwater monitoring wells to collect a vapour sample if the well screen is no more than 3m in length. However, version 1 of the finalized guidance does not mention the use of groundwater monitoring wells. Is it acceptable to use groundwater monitoring wells to collect vapour samples?

Yes, groundwater monitoring wells may be used to collect vapour data under certain circumstances. Sections 3.3 and 7.5 of the Science Advisory Board (2006) and Health Canada (2008) reports referenced in Technical Guidance 4 provide some guidance. However, please be reminded that it is the responsibility of the environmental consultant to demonstrate that appropriate sampling procedures were followed, and that samples collected are representative of the selected soil depth (using a detailed QA/QC program when using this sampling point).

If you take this approach, we recommend that you provide a detailed description and diagram of your sampling apparatus, and thoroughly defend the representativeness of the data collected. Such information will help in the review of your submission.

Standards - General

1) Could a site be cleaned up to meet the risk-based standards but still qualify as a contaminated site?

A contaminated site may be cleaned up using either the numerical or the risk-based standards. It is possible that a site cleaned up to meet the human health or environmental risk-based standards may still exceed the numerical standards. This is because the numerical standards are based on "generic" exposure assumptions (i.e. defined exposure scenarios) which are assumed to apply for the particular land use of a site (e.g. residential versus industrial). In contrast, the risk-based standards approach (i.e. the risk assessment approach) determines on a site-specific basis which exposure pathways actually are or are not present at the site.

2) What steps are taken to ensure that a site meets the remediation standards after cleanup?

For sites being cleaned up to meet numerical remediation standards, post-cleanup sampling and analyses are obtained to ensure that the contaminants have been removed and that the residual soil, water, sediment and vapours meet the applicable standards. For sites being cleaned up to meet risk-based standards, post-cleanup inspections and regular ongoing environmental monitoring are carried out to check that exposure to substances remaining in place continues to be appropriately risk managed and that the site continues to meet the risk-based standards.

3) When do the B.C. water quality guidelines for sediment, both for the approved criteria and the working guidelines, apply? What is their legal standing with regards to obtaining a Certificate of Compliance or Determination of Contaminated Site under the Contaminated Sites Regulation?

B.C. water quality guidelines for sediment represent generic ambient sediment quality guidelines and are used more commonly in the ministry's discharge authorization process for evaluating applications for proposed effluent discharges into uncontaminated areas or areas not impacted by human activity. The Schedule 9 sediment criteria are the applicable legal standards for obtaining a numerical based Certificate of Compliance or Determination under the Regulation.

4) What are the applicable standards for a fire hall?

As fire fighters often reside at a fire hall for long work shifts (i.e., several days), and because a fire hall constitutes an institutional setting, a fire hall would be considered a residential land use under the Contaminated Sites Regulation.

5) A homeless shelter has residential rooms on the 2nd floor and a kitchen and cafeteria at ground floor. What is the appropriate land use at this site?

The kitchen would be considered a commercial enterprise; therefore the appropriate land use standards at the site are commercial. However, if a daycare or living space was located at ground surface, the appropriate land use would be residential.

6) Is it possible for salt contaminated soils to be classified as hazardous waste?

"Hazardous waste" is defined in section 1 of the Hazardous Waste Regulation. Soil contaminated only by salt does not meet any of the criteria defining hazardous waste and is therefore not hazardous waste.

Whether landfills are permitted to take salt contaminated soil depends on the limits established in their permits issued by the ministry.

7) Chlorthal-dimethyl (Dacthal) has two different standards listed in Schedule 10 for the drinking water pathway (910 and 370). Which is the correct standard?

The correct drinking water protective standard for chlorthal-dimethyl (Dacthal) is 370µg/l).

8) Odours were noted in soils with non detectable soil volatile organic compound concentrations. Schedule 4 still references "odorous substances" and the CSST refers to the Soil Odour Quality Standards as an "aesthetic concern" that are protective of site receptors. My question is, what should we be doing with this Schedule 4 standard in light of Schedule 11? Soil vapour concentration monitoring is not included in our scope of work so I'm wondering if we should be concerned with the "Odour Standard" as I have personally never seen it applied at a site.

For due diligence purposes, the Schedule 11 vapour standards being toxicologically risk-based would take precedence over the aesthetic-based "odorous substances – not present" standard.

The odorous substances standard is a regulatory soil standard within the Regulation. Protocol 16, "Determining the Presence and Mobility of Nonaqueous Phase Liquids and Odorous Substances" specifies when the Director considers that an odorous substance is present at a site.

9) Is there a specific reason that methylnaphthalene was not included in Schedule 11?

The process for including a substance in Schedule 11 was as follows:

1. The ministry made a decision to limit consideration of volatile substances for Schedule 11 to only those substances already listed in Schedules 4, 5, 6, 9 or 10. This initially captured 2-methylnaphthalene as a possible substance for inclusion in Schedule 11, since it was already listed in Schedule 9.

2. The next step was to apply the B.C. Laboratory Quality Assurance Advisory Committee's (BCLQAAC's) recommended volatility definition (i.e., $VP > 0.05$ Torr and $H' > 1 \times 10^{-5}$ atm-m³/mole) to the list of prescribed substances to determine which of the prescribed substances was volatile. 2-methylnaphthalene: $VP = 0.055$ and $H' = 5.2 \times 10^{-4}$ was initially captured as a volatile prescribed substance. However, you will note that practically speaking, the substance is very close to being screened out as a volatile substance based on the criteria. Thus, it would be equally correct to view 2-methylnaphthalene as a semi volatile rather than a truly volatile substance.
3. Finally, for those volatile substances for which vapour toxicity reference values (TRVs) were available, Schedule 11 vapour quality standards were calculated. The hierarchy of TRV sources considered was: US Dept of Energy Risk Assessment Information System (RAIS), US EPA Region 9 preliminary Remediation Goals (PRGs) and B.C. Science Advisory Board (i.e. Health Canada) TRVs obtained from its Screening Level Risk Assessment document.

At the time of setting the Schedule 11 standards, no vapour TRVs were available from the above mentioned sources for 2-methylnaphthalene. Consequently, no Schedule 11 vapour quality standards were derived for the substance.

10) What phenols are used to derive the Schedule 6 standard for nonchlorinated phenols (total)? There is no associated footnote on the Schedule 6 table. Should we presume that the phenols used to calculate the Schedule 6 standard are the same as the phenols listed under Note 14 of Schedule 4?

The "nonchlorinated phenols (total)" or "total phenols" parameter of Schedule 6 is considered to be a "gross parameter" (i.e., relevant to the gross quantification of a particular class of chemical substances, rather the precise sum of specifically listed chemical substances). The measured concentration of "total phenols" present in water, for comparison to the Schedule 6 "total phenols" water quality standard, is determined using the 4-aminoantipyrine colorimetric analytical method specified in the [B.C. Laboratory manual](#). This method is relatively nonspecific and can capture a wide range of nonchlorinated phenolic substances which may be present in a particular water sample, including those listed under footnote 14 for soil in Schedule 4.

11) Schedule 10 includes all the dimethyl substituted isomers of phenol (i.e., the xylenols). Will the total nonchlorinated phenol standard presented under Schedules 6 be amended to include 2,6 and 3,4 dimethylphenol, rather than just the 2,4 dimethylphenol isomer?

See above response. The 4-aminoantipyrine colorimetric analytical method is capable of capturing the contribution of all three xylenols in the gross measure of total phenols present in a water sample. It would be incorrect to conclude that the total phenols standard only captures 2,4-dimethylphenol and excludes 2,6 and 3,4-dimethylphenol (or any other specific nonchlorinated phenolic substance for that matter).

12) The residential land standard for 2,4-dimethylphenol under Schedule 10 is 5 µg/g, while the same standard under Schedule 4 is 1.0 µg/g (for each of the phenols listed under Note 14). Could you clarify which standard should be used?

The Schedule 10 listing for the 2,4-dimethylphenol agricultural, residential and urban parkland soil standard (i.e., 0.1 or 5 µg/g) is incorrect. The correct listing is 0.1 or 1 µg/) for all the Schedule 4 footnote 14 listed nonchlorinated phenolic substances, which appear in Schedule 10 (i.e., 2,4-dimethylphenol, 2-methyl 4,6 dinitrophenol and phenol).

13) What is the land use for peat extraction operations?

Peat farming or mining would be considered an industrial activity. Therefore, Contaminated Sites Regulation standards for industrial land use would apply. However, if the land was to revert to a natural state or be used for some other activity following decommissioning of the extraction operations industrial land use may no longer apply.

14) Soil at a proposed landfill site contains background concentrations of arsenic above 20 µg/g (the standard for groundwater flow to surface water with freshwater aquatic life use). Are there any special considerations when applying for a landfill permit?

From the contaminated sites legal perspective, there would be nothing preventing an applicant from obtaining a landfill permit or operational certificate. However, it would be prudent to thoroughly characterize soil and groundwater prior to constructing the facility, since when the facility was to be decommissioned it might be necessary to show that contaminants not associated with operation of the facility are due to background concentrations.

15) How do I determine groundwater standards at a wide area site?

Wide area sites are large scale and complex, each with a unique set of circumstances. As such, general guidance is not applicable. Please consult the Director for specific advice related to your wide area site.

16) Do Schedule 6 water standards for irrigation use apply to land uses such as sports fields and golf courses?

The CSR definition for irrigation water use is tied to the use of water for agricultural purposes. Provided the sport field or golf course is not being irrigated to produce: hay, forage crops, pasture, cereal crops, vegetables or fruit, the CSR irrigation water standards do NOT apply.

However, should a proponent for a sports field or golf course wish to be reassured that the water used in their irrigation system was protective of the lawn or grass at their site, they might for their own purposes consider the CSR irrigation water standards.

17) I have a site which appears to have a "no water use" designation. My client would like the ministry to approve the no water use designation prior to further remedial work. Does the ministry provide such approvals? If yes, what would I have to submit as an Approved Professional to the ministry to obtain such an approval?

The CSR makes no official provision for a "no water use" designation. More properly then, your client is seeking confirmation that none of the CSR specified water uses apply at the site.

Under section 12 of the Contaminated Sites Regulation, the Director may specify land, water and sediment uses at a site (see sections 12 (3), (4), (4.1)). Note that this is a discretionary power of the Director. Also, please see section 12 (5) which list the factors that the Director must consider when exercising the above discretionary power.

In the case of Approved Professional submissions, it would be unusual for the Director to exercise directly this power under section 12 since Approved Professionals are qualified to make such assessments.

Further, should your client wish to seek the Director's confirmation that the CSR specified water uses do not apply at the site, designation, your client should anticipate being required to submit a contaminated sites service application together with a report describing all relevant information required under section 12 (5) prior to the Director making such a ruling. Note that the Director may

elect not to exercise his or her discretionary authority under section 12 of the Contaminated Sites Regulation.

18) At a site with contamination near the surface and with a thick confining layer, does the travel time guidance apply to a drinking water aquifer at depth? The estimated "travel time" to the aquifer is longer than 100 years in a vertical direction.

Starting February 1, 2011, travel time will no longer be used to determine the applicability of drinking water use at contaminated sites. Please refer to the amended Technical Guidance 6 entitled "Water Use Determination" to determine if DW applies at your site. There are possible exemptions from drinking water use in shallow aquifers existing above deeper confined aquifers.

19) I am involved with a site at which a hydraulic oil leak was discovered in the early 1990s. A product recovery system was installed to remediate the NAPL plume resulting from the leak. The system has been in operation for several years and NAPL is now at residual levels. We want to establish contaminant concentration targets which would indicate that remediation is complete. The site has an industrial land use and there is no groundwater use.

The remediation standards for NAPL are not explicitly defined in the CSR. The Director's current advice on application of the default generic numerical soil and water standard for "non-aqueous phase liquids not present" may be found in [Protocol 13, Screening Level Risk Assessment](#).

20) Can site-specific standards (SSS) be developed for groundwater? Section 11(2) of the CSR indicates that site-specific standards may be developed for groundwater and surface water?

No CSR protocol to establish site-specific standards for water exists, so although the ability is enabled under the Regulation, it is not possible to develop SSS for groundwater.

21) Should drainage ditches be remediated to soil or sediment standards?

The remediation standards applicable to the ditch will depend on whether the ditch is considered aquatic or terrestrial habitat. If a ditch is regularly maintained by a private party, a local government or provincial ministry and is dredged or bottom scoured on a regular basis, the ditch would likely be considered terrestrial habitat and applicable soil standards would apply. If the ditch is considered

aquatic habitat, sediment standards would apply. If the local government is not able to advise you on the appropriate habitat classification, a professional biologist should be consulted to characterize the habitat of the ditch.

22) My commercial site is undergoing remediation. A stream passes through a portion of the site. How do I delineate the riparian area and what are the appropriate remediation standards for the stream bed and riparian area?

The stream bed (i.e. submerged ground underlying the stream) would be considered sediment while the riparian strip is considered to be wildlands. The width of the riparian strip is often specified in local government bylaws. In the absence of local government direction on riparian strip width, please refer to the Riparian Areas Regulation.

23) Drinking water use applies at my site, a former service station. Groundwater has been remediated to appropriate standards for petroleum hydrocarbons but iron and manganese continue to exceed drinking water standards. What are my options if I want to obtain a Certificate of Compliance for the site?

In order to get ministry signoff for a Certificate of Compliance, the exceedances would need to be addressed. This could be/may be done by:

- Ruling out the applicability of the drinking water standards to the groundwater
- Assessing background levels of iron and manganese to obtain a release under Protocol 9, "Determining Background Groundwater Quality".
- Performing low flow sampling, which may identify lower concentrations.
- Undertake a risk assessment for the site, if altered redox condition, in consequence of the degradation of residual hydrocarbons from the former gas station, is the cause of the metal exceedances and it is not known how long it will take for metal concentrations to decline to former levels.

24) Has the 10x multiplier for assumed minimum dilution capacity in the receiving environment that was applied to the ambient aquatic life water quality guidelines to derive the CSR aquatic life standards ever been empirically tested?

No. The use of the 10x multiplier was dictated as a matter of ministry policy to reconcile CSR regulatory consistency with long-standing considerations of dilution capacity when authorizing discharge permits under the former Waste Management Act, and other existing regulations (e.g.

Antisapstain Regulation). At the time the CSR was under development, many permits assumed an availability of 20:1 dilution. The Contaminated Sites Standards Taskgroup (CSST) considered three options related to typical dilution capacity in B.C. receiving waters:

1. Assume no dilution is available (i.e., set CSR aquatic life standards equal to ambient aquatic life water quality guidelines);
2. Assume 20:1 dilution was routinely available (i.e., set CSR aquatic life standards equal to 20x ambient aquatic life water quality guidelines); and
3. Assume 10:1 dilution was routinely available (i.e., set CSR aquatic life standards equal to 10x ambient aquatic life water quality guidelines).

The ministry adopted option 3, the 10:1 assumption (see attached excerpt re: Regulatory Consistency from Contaminated Sites Standards Review Workshop. March 20-22, 1996). [B.C. Environment Responses to Expert Panel Recommendations.](#)

25) In CSR Schedule 6, there are two standards for zinc when hardness is 90: 75 and 150 (this happens to be relevant at a site I'm currently dealing with, as it has one well with a hardness of exactly 90, and a zinc concentration of 130).

Use the following when determining applicable aquatic life standards:

for cadmium

0.1 @ H <30
0.3 @ H = 30 and <90
0.5 @ H = 90 and <150
0.6 @ H = 150 and <210

for zinc

75 @ H <90
100 @ H = 90 and <100
900 @ H = 100 and <200
1 650 @ H = 200 and <300
2 400 @ H = 300 and <400

26) Is there a standard for NH₄⁺ or NH₃ in soil and if not what is the best approach to evaluate what levels of cleanup are needed (risk based standards in groundwater or soil)?

Neither ammonia (NH₃) nor ammonium (NH₄⁺) is a prescribed substance in soil under the Contaminated Sites Regulation. Consequently they are not regulated in soil for CSR purposes and you have no duty to characterize the soil of your site for these two substances.

Note however that CSR Schedule 6 provides Aquatic Life water quality standards for ammonia.

In selecting Potential Contaminants of Concern for use in risk assessment, usually only those substances for which there is historical evidence of commercial/industrial use at the site, or for which a spill or other source of contamination by the substance is suspected or can be reasonably inferred, are selected.

27) The metals exceedances in groundwater are sporadic across a site and are typically <20% over the marine standard. These results appear to be related to the fact that the groundwater is strongly reducing with very high iron concentrations (>100 mg/L). These reducing conditions appear to be naturally occurring and are not due to the presence of an oxidizable organic contaminant (i.e., no hydrocarbons detected).

Can statistical arguments be used to explain groundwater exceedances, or is there some other sort of approach we could use?

Historically, the ministry has accepted: statistical approaches to characterizing concentrations in single wells where concentrations fluctuate temporally or trends are downward, statistical arguments for characterizing zinc concentrations in single wells where both the pH and zinc concentrations fluctuated temporally, and localized metal exceedances that are within 10% of the CSR standard.

The ministry has not accepted statistical representations of spatial groundwater data for purposes of site characterization except for approvals under Protocol 9, "Determining Background Groundwater Quality". The approach has been used in some circumstances for sites under remediation.

In general, because groundwater investigations are so limited and methods so imprecise relative to the temporal and spatial variability that exists, the ministry believes that only in rare circumstances is adequate data available to conduct valid statistical analysis, except for single wells.

Based on the limited data provided, it is recommended that you proceed with a background groundwater quality determination application.

28) I am working on a site where we are applying irrigation standards to groundwater. We have molybdenum in groundwater at 11µg/L. The standard indicates that it is 10-30µg/L.

Can you please clarify how I should apply the standard?

The CSR irrigation water standards ensure that molybdenum present in irrigation water used at a site will not result in molybdenum enrichment in the soil to such an extent that forage crops grown on the site will bioconcentrate molybdenum to a level which would induce molybdenosis in herbivores (i.e. cattle).

Depending on the forage conditions at your site, apply the following:

Crop Type	Soil Drainage	Cu:Mo Ratio in Irrigation Water	Appropriate molybdenum irrigation watering standard
forage	poorly drained	<2:1	10 µg/L
forage	poorly drained	>2:1	20 µg/L
forage	well drained	N/A	20 µg/L
non-forage	N/A	N/A	30 µg/L
at sites where crop type, soil drainage or Cu:Mo ratio in the irrigation water is unknown			10 µg/L

Note: information related to soil drainage and occasionally soil pH, and copper and molybdenum content, can often be obtained by reference to soil survey maps.

29) In the CSR for ammonia freshwater, it states that the standards are pH and temperature dependent and the standards presented assume 10° C. For marine water, it states that the standards are pH, temperature and salinity dependent and the standards presented assume 10° C and salinity of 10 g/L. If we are outside the assumed ranges is there guidance available to determine the standards as there is for chlorophenols (Technical Guidance 9)?

Unlike Technical Guidance 9, "Chlorophenol Aquatic Life Water Quality Standards" there is no compiled CSR guidance for ammonia. Rather footnotes 5 and 7 of Schedule 6 recommend consulting the Director for further advice.

The director would normally use the following two tables to derive: pH and temperature specific ammonia standards for freshwater aquatic life; and pH, temperature and salinity, specific ammonia standards to protect marine aquatic life.

The aquatic life water (AW) standards of CSR Schedule 6 are based on the B.C. Approved Water Quality Guidelines for Nitrogen – nitrate, nitrite, ammonia circa 1986 (freshwater AW) and 1990 (marine AW). These guidelines were updated in 2001; however, the changes (to marine guidelines) have not yet been used to revise the Schedule 6 standards.

Freshwater

The freshwater CSR Schedule 6 aquatic life standards are based on “Table 4. Average 30-day Concentration of Total Ammonia Nitrogen for Protection of Aquatic Life” from the approved guidelines see <http://www.env.gov.bc.ca/wat/wq/BCguidelines/nitrogen/nitrogen.html>. That table provides pH (6.5 – 9.0) and temperature (0° C – 20° C) dependent freshwater guidelines for ammonia.

Marine

The marine CSR Schedule 6 aquatic life standards are based on “Table 2. Average 5 to 30 day Concentration of total Ammonia Nitrogen for Protection of Saltwater Aquatic Life” from the ministry’s approved water quality guidelines – see <http://www.env.gov.bc.ca/wat/wq/BCguidelines/ammonia.html>. Note that the marine water quality guidelines were changed between 1990 and 2001 so the Schedule 6 standards in some cases differ from the Table 2 water quality guidelines). Table 2 provides pH (7 – 9), temperature (0° C – 25° C) and salinity (10 -30 g/kg) dependent marine water quality guidelines for ammonia.

30) In the CSR for fluoride, it states that the livestock watering standard is dependent on type of livestock, but a standard of 1000 is presented. Is this standard a minimum that would represent the worst case scenario?

The CSR Schedule 6 livestock watering water quality standard for fluoride is based on the B.C. Approved Water Quality Guidelines for fluoride.

The Schedule 6 standard is specific to:

- wildlife,
- dairy cows,
- breeding stock (e.g. laying hens, sows, etc.), and
- any livestock raised on high fluoride feed or mineral or bone meal supplements.

The standard does not incorporate a wide margin of toxicological safety and should be viewed as a general, worst-case maximum to protect all livestock. On a site-specific basis, for short-lived, non-reproductive livestock (i.e., livestock other than those listed above), the director might approve raising the standard to a maximum of 2000 µg/L.

However, that level would severely limit the type of livestock associated with a CSR agricultural land use and would likely require specific livestock type restrictions on any Certificate of Compliance issued.

31) Please provide the details on the derivation of arsenic standards in livestock ingesting soil and fodder. We are unable to find a reference to the TRV in the literature.

The arsenic livestock ingesting soil and fodder standard was derived in 2000. At that time, no suitable herbivore TRV was available for arsenic. Consequently, a surrogate TRV was derived using a carnivore (beagle dog) in accordance with the Contaminated Soils Standards Taskgroup protocol. So, it is not surprising that you can't find a TRV for arsenic in the literature.

Terms

TRV: Toxicity Reference Value (mg/kg/d - calculated value)

BW: Body Weight (kg - derivation assumes young pig BW = 30 kg)

IRfood: Ingestion Rate Food (kg/d - derivation assumes young pig IRfood = 2.93 kg/d)

Bv Soil: Soil to plant transfer coefficient (unitless - derivation assumes Bv = 0.0371, *Bechtel and Jacobs, 1998*)

MATC: Maximum Tolerable Concentration (mg/kg/d – calculated value)

UF: Uncertainty factor cross species extrapolation (unitless - derivation assumes UF = 3 extrapolation from dog LOAEL to pig)

LOAEL: Lowest Observed Adverse Effect Level (mg/kg/d – derivation used LOAEL of 2.2 mg/kg/d for beagle dog)

NOAEL: No Observed Adverse Effect Level (mg/kg/d - calculated value)

ACR: Acute to Chronic Ratio (unitless - derivation assumes ACR of 5.6)

Derivation

$$\text{(Soil standard) } C_{\text{soil}} \text{ (mg/kg)} = \frac{TRV \times BW}{[(IR_{\text{food}} \times Bv) + IR_{\text{soil}}]}$$

Where:

|

$$\text{TRV} = \frac{\text{MATC}}{\text{UF}}$$

$$\text{MATC} = \sqrt{\text{LOAEL} \times \text{NOAEL}}$$

$$\text{NOAEL} = \frac{\text{LOAEL}}{\text{ACR}}$$

The math works out to 24.5575 mg/kg. For the Schedule 5 matrix this was rounded up to 25 µg/g.

32) Can ecological risk assessments default to the Schedule 5 Toxicity to Soil Invertebrates and Plants standards of the Regulation as TRVs for all terrestrial ecological receptors (including wildlife) when the Eco-SSL soil screening levels are lower than the Regulation’s matrix standards?

Yes. For some substances (for example bioaccumulative substances) one or more of the substance Eco-SSLs will be more stringent than the corresponding Soil Invertebrate and Plant standard in Schedule 5 of the Regulation. Remediation of the site to the Invertebrate and Plant standard for these substances would satisfy the numerical standards for soil for this pathway. Remediation of the site to the Eco-SSLs would address potential risks to ecological receptors via the range of exposure pathways. Under the Regulation, remediation to either the numerical or risk-based standards is acceptable. In this case, the decision of appropriate risk assessment endpoints is left to the qualified professional.

33) Can pea gravel impacted by leaking hydrocarbon underground storage tanks be used as backfill if hydrocarbon concentrations meet applicable land use standards even if there is visual evidence of hydrocarbon staining?

It is possible that the pea gravel (as soil) may meet applicable land use soil standards but exceed the CSR’s vapour standards for the site. The hydrocarbon contaminated pea gravel could also leach petroleum hydrocarbons to groundwater. Determining if re-use of the pea gravel on the site is appropriate requires consideration of all impacted media.

34) What are the appropriate land use standards for a library?

Commercial land use.

35) Schedule 5 of the CSR provides a standard for DDT which includes DDT metabolites. Is the Schedule 5 standard for "total DDT" OR does it apply to each metabolite (i.e., do we need to analyze for each analyte)? Is this the same for Schedule 6?

The standards in Schedules 5 and 6 are for "total DDT" and the analytical method to determine that parameter is provided in the [BC Environmental Laboratory Manual](#). A total DDT measurement will represent the total concentration of DDT isomers, their metabolites plus isomers of DDT metabolites.

36) When conducting QA/QC on chemical data, what is the acceptable relative difference for chemical field results?

It is recommended that the relative percent difference (RPD) for duplicate field samples not exceed 1.5 times the acceptable lab RPD for the same compound. The lab RPDs can be found in the [BC Environmental Laboratory Manual](#).

37) Within the Contaminated Sites Regulation Schedule 4 non-chlorinated phenols include cresol. In Schedule 6, non-chlorinated phenols under Freshwater Aquatic Life are listed as "total" with a standard of 10 ug/L. Does the intent of "total" listed in Schedule 6 encompass the same definition of non-chlorinated phenols as indicated in Schedule 4 (i.e., all non-chlorinated phenols)?

For CSR purposes, the concentration of "total phenols" in water for comparison to the Schedule 6 water quality standard is determined using the 4-aminoantipyrine colorimetric analytical method specified in the [BC Laboratory Manual](#). This method is relatively non-specific and can capture a wide range of specific non-chlorinated phenolic substances present in a sample, including those listed under footnote 14 for soil in CSR Schedule 4.

In addition, as hydroxyphenols are of considerable toxicological concern in regard to non-chlorinated phenolic toxicity, total phenols in water should also include measures of hydroxyquinone and resorcinol in addition to the listed Schedule 4 substances.

Total phenols" in water should represent the sum of:

- 2,4-dimethylphenol,
- 2,4-dinitrophenol,

- 2-methyl 4,6-dinitrophenol,
- 2-nitrophenol,
- 4-nitrophenol,
- phenol,
- cresol (o-cresol, m-cresol, p-cresol),
- 3-hydroxyphenol, and
- 4-hydroxyphenol.

38) Are there tax breaks for people redeveloping contaminated sites?

Tax incentives may exist with certain local governments under section 226 of the Community Charter. Local governments may also provide incentives in the form of fast tracking development permits or reducing fees for brownfield sites undergoing redevelopment. Please check with the planning department of the local government.

You may also want to check directly with provincial and federal tax authorities although we are not aware of specific tax breaks for remediation activities.

39) What is the best method to estimate the bulk background total dissolved solids (TDS) concentrations within an aquifer?

The ministry considers that the 95 percentile concentration as the most representative background groundwater concentration. For more information please refer to Protocol 9 "Determining Background Groundwater Quality".

40) Is Yale within the Lower Mainland? Using Figure 1 of the protocol it is difficult to see which region Yale is located.

Yes. Please use Protocol 4, Table 1, Column III, Region 2 (Lower Mainland) - Regional Background Soil Quality estimates to assess your site located in Yale, B.C.

41) In Schedule 5 under cadmium soil standards the intake of contaminated soil standards for agricultural land, park land and residential lands (AL, PL and RL respectively) are all 3 or 35 µg/g. Footnote 3 states "If land is used to grow produce for human consumption, the standard is 3 µg/g; if not, the standard is 35 µg/g." This makes sense for AL, but not so much for PL and RL. Does the standard of 3 only apply if there is a garden on the PL or RL land?

Yes, essentially the cadmium soil standard of 3 ug/g applies on agricultural, residential and urban parkland if the land is used to grow produce for human consumption. Typically the cadmium soil standard of 3 ug/g is assumed to apply at all agricultural sites and at all single family residential sites where it is reasonable to assume that vegetables or other produce for human consumption could be grown. In contrast at high density residential sites, (e.g., high rise apartments) often apartment residents are prohibited by the apartment owner, or by municipal bylaw, from using the site to grow produce. The same assumption of a prohibition or other regulatory control to negate growing produce is also assumed to typically hold in the case of urban parks.

However, exceptions to these generalizations do on occasion occur. For example some urban parks contain community garden plots where anyone can grow vegetables, and at some single family residences (e.g., located entirely on bedrock, or where all the native soil of the site has been completely concreted over) it may be more reasonable to assume that produce cannot be grown.

Consequently, the application of the correct cadmium standard is subject to professional judgement. A consultant wishing to deviate from the general assumption that the cadmium standard of 3 ug/g applies at an agricultural, residential or urban park site is advised to document such reasons in any site characterization or remediation report prepared for a particular site.

42) We are remediating a site for mixed-use buildings with high rise residences over commercial units and several low rise residences. What land use standard is applicable if the entire site is built atop underground parking?

If there is any living space at ground surface the land use would be considered residential.

43) The recent interim standard document for manganese in drinking water only mentions superseding Contaminated Sites Regulation Schedule 6. Should it indicate that the interim drinking water standards for manganese supersede the values indicated in both Schedules 6 and 10 of the Contaminated Sites Regulation?

The toxicologically-based Director's Interim Generic Numerical Drinking Water Standard for manganese (550 ug/L) replaces the former Contaminated Site Regulation drinking water standard for manganese (50 ug/L) in both Schedule 6 and Schedule 10 of the Regulation.

44) Question 21 in the Standards section of the Q&As discusses soil quality issues associated with drainage ditches. On a similar vein, if a drainage ditch is not

considered aquatic habitat but is hydraulically connected to a stream, what surface water quality criteria would apply to water in the ditch?

If the drainage ditch that you reference is connected to a creek, you should ensure that at a minimum BC Water quality guidelines are met at the point where the ditch drains into the creek.

Standards - Water Use Determinations

1) Under new Technical Guidance 6 can a risk-based Certificate be obtained for a site where future drinking water use applies but there is no current use of water for drinking purposes?

Yes. Where future drinking water use has been determined to apply at a site but there is no current drinking water use, risk-based Certificates of Compliance can be obtained. Schedule B clauses in these certificates normally would include restrictions on water use, monitoring requirements and may include other conditions depending on site circumstances.

2) If drinking water use applies to my site and I wish to obtain a risk-based Certificate of Compliance will I need to register a covenant on the land title prohibiting water use for drinking?

Normally, covenants restricting water use would not be required as a condition for obtaining a risk-based Certificate of Compliance for sites where drinking water use applies. However, there may be circumstances where covenants are warranted and may be required to obtain a risk-based Certificate of Compliance. Examples include situations where an onsite or offsite well must be deactivated due to the presence of contamination above drinking water standards or contamination occurs in an area where the groundwater is commonly used as a drinking water source.

3) Will risk assessment need to address the ecological risk posed by the migration and discharge of potentially toxic concentrations of iron and manganese to the receiving environment at sites where iron and manganese exceed their drinking water standards?

In the absence of aquatic life standards for iron and manganese, there would be no need to assess these potential ecological risks at most sites. However, for those sites adjacent to or in proximity to aquatic habitats or where preferential pathways direct groundwater flow to aquatic habitats,

investigation and assessment of dissolved iron and manganese may be necessary to demonstrate the absence of pollution at the point of discharge to the receiving environment.

[Technical Guidance 15, "Concentration Limits for the Protection of Aquatic Receiving Environments"](#) provides guidance for assessing the need for risk assessment of areas near aquatic receiving environments. Under the draft guidance, if concentrations of dissolved iron and manganese in groundwater 1 m inland from the high water mark or in porewater adjacent to the receiving environment do not exceed the B.C. water quality guidelines for aquatic life the water quality would meet provincial objectives and would therefore not require further assessment. Where concentrations at the 1 m setback point or in porewater exceed the B.C. water quality guidelines, further assessment and scientific arguments may need to be presented to demonstrate an absence of pollution. Ecological risk assessment is a valid approach for use in demonstrating an absence of pollution at a contaminated site.

4) During a preliminary site investigation we identified one water-well within 500m of our property. We have confirmed that our property is supplied by municipal water supply and the well is no longer active. Groundwater quality at the site meets aquatic life standards but exceeds drinking water standards for some compounds. Under these conditions, do drinking water standards apply to our site whether or not anyone is using that water?

The intent of Technical Guidance 6, "Water Use Determination" is to protect groundwater today for future use. Thus If there is an aquifer underlying your site that can support (as determined by the quality and quantity of the water) a single family dwelling, drinking water standards apply. There are some exemptions listed in Technical Guidance 6 (for example: shallow perched aquifers, aquifers contained within organic soils or if the aquifer is protected by a natural confining barrier, drinking water use may not apply in the shallow aquifer). You can determine whether any of these exemptions apply to your site using the evaluation provided in Technical Guidance 6.

Standards - Water Use Evaluation

1) When can the "no-water use" determination be used and how do we prove that "no water use" exists?

If none of the water uses specified in the CSR (drinking, aquatic, irrigation or livestock water uses) apply at a site based on an assessment of water use under Technical Guidance 6, then no water use applies at your site. If this is the case, the only water standards that would apply are for VH_{w6-10} and

EPH_{w10-19} and NAPL not present. Applicants are responsible for ensuring that adequate investigations are done to meet the exemption criteria specified in Technical Guidance 6. Where there is uncertainty about the applicable water use, a [Contaminated Sites Service Application](#) for a Director's determination of water use may be submitted.

2) If drinking water use applies at a site, should the groundwater be assessed against both water and soil drinking water protective standards?

Yes. If drinking water use is confirmed under the initial drinking water assessment process described in Technical Guidance 6, the site must be further assessed against all drinking water relevant standards (i.e., CSR Schedule 6, 10 drinking water use water standards and CSR Schedule 5 soil standards to protect groundwater used for drinking water).

3) Clause 18 of the Public Health Transitional Regulation restricts the installation of drinking water wells within 400' of a cemetery or a dumping ground. Based on this, is future drinking water use, as required under new Technical Guidance 6, not applicable adjacent to a landfill or cemetery?

Currently, there are no drinking water use exemptions for sites based on land uses. A risk-based Certificate of Compliance may be obtained for sites with restricted water uses.

4) Why are there no drinking water use exemptions for industrial lands as was proposed in earlier drafts of Technical Guidance 6?

In finalizing version 1 of Technical Guidance 6, the ministry considered at length the merits of exempting industrial lands from drinking water use. Ultimately the exemption was not adopted because it would:

- be inconsistent with the fundamental principle of groundwater protection;
- create more "no water use" industrial lands with no applicable water standards other than VHW and EPHw;
- be difficult to administer as offsite migration from industrial lands onto non industrial lands would require new procedures to ensure adequate assessment and remediation of affected offsite lands;
- result in inconsistent and inequitable regulatory processes for industrial source sites and non industrial affected sites where source sites would be deemed uncontaminated while affected sites with the same substance concentrations would be deemed contaminated. Often these different land uses occur at properties immediately adjacent to each other.

5) Are there any drinking water use exemptions for industrial lands located next to the marine foreshore where seawater may affect the quality of the aquifer?

Technical Guidance 6 does not include drinking water use exemptions specific to industrial lands located next to the marine foreshore. This is because many aquifers located next to the marine foreshore represent valuable sources of drinking water with yields exceeding the threshold limit of 1.3 L/min (500 gallons per day). Depending on site conditions, other exemptions provided in Technical Guidance 6 may apply at sites bordering the marine foreshore.

6) If you have an aquifer with a saltwater wedge, does drinking water use apply in the upper fresh portion of the aquifer if total dissolved solids (TDS) concentrations in the lower portion (where wedge occurs) exceeds 4,000 mg/L?

Salt wedges commonly only affect a portion of an aquifer. If the unaffected portion is less than 1 m thick; present only seasonally; or is contained within organic soils, then drinking water use does not apply. Otherwise, drinking water use applies.

7) If you determine that the hydraulic conductivity of your aquifer is less than 10^{-6} m/s and thus the yield is such that you cannot produce enough drinking water for a single family dwelling, do you still need to do capture zone analyses for the current drinking water use evaluation as specified in Q1 of Technical Guidance 6?

If there is a current drinking water well at or near your site, drinking water use applies irrespective of the hydraulic conductivity measured at your site. Capture zone analyses described in Q1 may be used to exempt your site from current drinking water use if it can be shown that any current drinking water wells or surface water intakes near your site are not drawing in groundwater from your site.

8) Can you use information provided in B.C.'s Water Resource Atlas to determine whether or not a contaminated site is subject to drinking water standards?

No. B.C.'s Water Resource Atlas only provides information on general aquifer characteristics and cannot replace hydrogeological information gathered through site-specific information (e.g., surficial geology or local hydrogeological maps) or investigation. If a conservative determination of drinking water use is made at a site, it does not need to be supported by site-specific information or investigation. Note: this information or investigation is a separate matter from investigations conducted under the *Environmental Management Act* and the CSR to characterize site contamination.

9) Q2 of Technical Guidance 6 refers to an “aquifer below your site”. Is the aquifer in question immediately below or at any depth below your site?

The intention of Q2 is to protect the water use of all viable aquifers below a site. This includes deeper aquifers that may be present.

10) If preferential pathways exist when evaluating current drinking water use, how do you prove they are not a concern?

To determine current drinking water use under Technical Guidance 6, additional evaluation of contaminant migration along the preferential pathway is required. To conclude that current drinking water use does not apply, the evaluation must demonstrate that the contaminant plume is stable or shrinking, and attenuating prior to impacting the nearest groundwater well. Solid arguments supported by site data must be presented. Guidance on the assessment of preferential pathways can be found in [Technical Guidance 8, “Groundwater Investigation and Characterization”](#) and the background document [“Groundwater Investigation in Site Assessment”](#).

11) Do you have to drill to the bottom of an aquifer to determine theoretical aquifer yield or can you drill to a targeted aquifer thickness?

It is not necessary to drill to the bottom of an aquifer to ascertain theoretical aquifer yield. A minimum saturated thickness at which the aquifer will yield 1.3 L/min (the yield threshold for determining drinking water use) may be calculated using the unconfined aquifer solution provided in the appendix of Technical Guidance 6. It is not possible to calculate a minimum saturated thickness for confined aquifers using the solution provided without first knowing static water levels at your site. In this situation we recommend using the unconfined solution for a conservative estimate of minimum thickness required for confined aquifers.

12) In the northern interior of B.C. there are sites with groundwater which is not considered potable due to high concentrations of dissolved solids that occur naturally. What do we do in these situations?

For sites where naturally occurring concentrations of dissolved solids exceed 4,000 mg/L, drinking water use does not apply. For sites where naturally occurring concentrations of dissolved solids do not exceed 4,000 mg/L, there is the option to assess background concentrations under [Protocol 9, “Determining Background Groundwater Quality.”](#)

13) Is there any flexibility under Technical Guidance 6 regarding the 5 m confining unit below the contamination with a hydraulic conductivity of less than 1×10^{-7} m/s? For example, what if site conditions were such that there was a 50 m confining unit below the contamination with a hydraulic conductivity of 1×10^{-6} m/s?

The confining geological unit is defined in Technical Guidance 6 as having a hydraulic conductivity less than or equal to 10^{-7} m/s and therefore drinking water use cannot be ruled out in this example. Depending on site circumstances [Protocol 13, "Screening Level Risk Assessment"](#) may be used to demonstrate that groundwater attenuation to drinking water standards can be achieved prior to groundwater reaching the property boundary. Detailed risk assessment may also be used to demonstrate that groundwater attenuation to drinking water standards will be achieved prior to groundwater reaching any drinking water supply wells in the vicinity of the site.

14) Does drinking water use apply to an upper sand unit with a saturated thickness of less than 1 m if there is a well currently located within the vicinity of the groundwater contamination source (i.e., 500 m) and the well is in a deeper aquifer protected by a natural geological barrier as defined in Q4 of the future drinking water use evaluation?

Unless there is currently a drinking water well in the upper sand unit, drinking water use would not apply. Please be aware that current drinking water well(s) in the deeper aquifer may provide a conduit for cross-contamination and the potential for this should be evaluated.

Note: Technical Guidance 6 states under Q1 (is the water currently used for drinking) that "exemptions provided under the future drinking water use evaluation are not allowed if there is a current drinking water use at or near your site." The Q4 exemption (is there a confining geological unit present) is an exemption under the future drinking water use evaluation. Disallowing the Q4 exemption in the evaluation of current drinking water use was not intended and resulted from restructuring exemptions in the final draft (Q4 applied independently of the current or future drinking water use evaluation in draft TG6). This error will be corrected at such time as Technical Guidance 6 is amended. Until this occurs, the Q4 exemption is considered to apply in the evaluation of both current and future drinking water use.

15) Can you exclude irrigation or livestock watering water uses if a deeper aquifer is protected by a natural barrier, as with Q4 of the drinking water evaluation?

Under new Technical Guidance 6 irrigation and livestock watering water uses apply to all aquifers at sites where the land use is agricultural or the land is within a designated Agricultural Land Reserve unless the hydraulic conductivity is determined to be $< 10^{-6}$ m/s. If there exists a deeper aquifer protected by a natural confining layer as specified in Technical Guidance 6, irrigation and livestock watering water uses may be ruled out provided the shallow aquifer is also determined not to have an irrigation or livestock watering water use.

16) Under Technical Guidance 6, the ministry will only recognize municipal water use designations in water management plans approved under the Water Act. However, only the Township of Langley has developed such a plan, and this plan has been yet to be approved. As an alternative, shouldn't there be an exemption for drinking water use in urban areas?

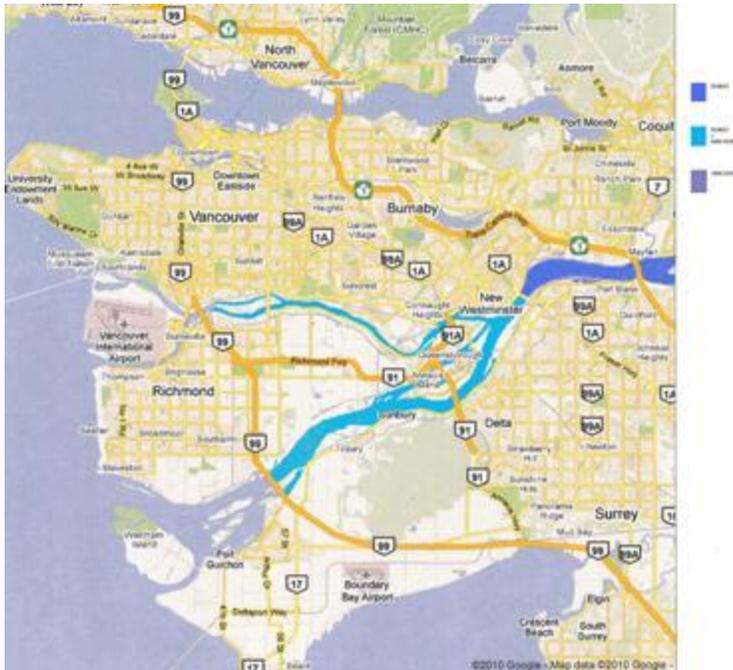
Technical Guidance 6 does not provide drinking water use exemptions for urban centres for the following reasons:

- Municipalities are not authorized under the Water Act to control the installation of water wells in their municipalities other than wells they are installing for municipal supply.
- There are a number of urban areas in B.C., both large and small, where municipal drinking water wells exist within municipal boundaries. As water demands increase the need for additional multi-use supply wells will follow.
- There is an increasing trend to construct private wells in urban centres. These wells are currently constructed predominantly for irrigation and geothermal purposes. This trend is expected to continue to grow in response to climate change and will create growing water demand pressures for major urban centres
- The guidance reflects the increasing value and public's expectations for maintaining groundwater as a resource for all water uses.

17) Does the ministry have a rule of thumb where along the Fraser River the water is considered marine versus freshwater?

The ministry considers under the CSR:

1. that above the Pattullo Bridge the river is freshwater, and
2. that below the George Massey tunnel on the Main Arm of the Fraser, or below the western most tip of Mitchell Island (i.e., southern foot of Cambie Street) on the North Arm of the Fraser, the river is marine/estuarine (see attached map).



Between the above demarcation points, the salinity of the River may vary and should be determined, either by an appropriate water sampling and salinity analyses program, or by reference to a credible scientific authority (e.g., FREMP, the ministry, Environment Canada, etc.). Alternately, a proponent may elect not to characterize the salinity of the river, but simply use the more conservative (i.e., more stringent) of the freshwater or marine/estuarine protective Contaminated Sites Regulation standards to assess their site.

Types of Contamination - Hazardous Waste

For specific regulations regarding the management of hazardous waste please refer to the Ministry's Hazardous Waste website.

Types of Contamination - Illegal Drug Laboratories

For basic information regarding the regulation of illegal drug manufacturing sites, refer to [Fact Sheet 35, "Requirements for the Environmental Cleanup of Illegal Drug Manufacturing Sites"](#).

Types of Contamination - Mine Sites

1) What are the requirements to provide independent remediation notices for active mine sites operating under a Mines Act permit? Also, are the remediation standards

specified in the Contaminated Sites Regulation applicable to operating mine sites? Are there any other constraints to applying Part 4 of the *Environmental Management Act* to mine sites?

The requirements to submit notifications of initiation and completion of independent remediation apply to mine sites as they would to any other site in the province. The provisions of Part 5 of the *Environmental Management Act* (EMA) currently do not affect the requirements in Part 4 (Contaminated Site Remediation) unless there are specific sections doing so. There are no provisions in Part 5 which exempt a person from the duty to provide a Notification of Independent Remediation under Part 4.

In response to the question on the environmental quality standards applicable to operating mines, there is only one set of legally binding environmental quality standards used in the province in association with contamination of soil, water, sediment and vapour. They have been established under the *Environmental Management Act* and are provided in various schedules in the Contaminated Sites Regulation. Lands under Federal jurisdiction may be using other values, but those are not for lands under provincial jurisdiction and therefore may not be legally binding.

Regarding other issues, there are specific constraints in Part 5 on the ability of a Director to issue a remediation, pollution abatement, and pollution prevention order, but no constraints on his or her ability to issue a site profile or site investigation order or on the imposition of requirements under independent remediation provisions in section 54 (3) (d). If any of the latter were to be issued, this ministry would normally consult closely with Ministry of Energy and Mines staff. There are legal provisions allowing the Minister of Environment to delegate responsibilities for administering Part 4 of EMA to other ministries, but to date, there are no cases where this has been done.

Also, the Ministry of Environment often is involved in the regulation of mine sites under other parts of EMA (for example spill response and the authorization of discharges) and other sections of Part 4 (for example, the issuance of Certificates of Compliance and Determinations of Contaminated Site). Independent remediation is only one of a number of ways in which this ministry may be linked to mine sites.

Types of Contamination - Contaminant Migration

1) Is a property owner required to provide migration notification based on groundwater analytical results related to a site investigation or a site cleanup conducted sometime in the past? Are migration notifications required if you are just performing some routine monitoring but not actively investigating?

The following is provided as general guidance on circumstances that do or do not trigger the requirements for the submission of a NOM. Please consult [Fact Sheet 34, "Requirements for Responding to Contaminant Migration"](#) for additional information.

A NOM is required:

- If a site investigation is underway and the site investigation discloses that one or more substances has migrated or is likely to have migrated to a neighbouring site or is likely causing contamination at the neighbouring site.
- If independent remediation is underway and the independent remediation discloses that one or more substances has migrated or is likely to have migrated to a neighbouring site or is likely causing contamination at the neighbouring site.
- If vapour, groundwater or surface water monitoring are ongoing as part of an ongoing site investigation or ongoing independent remediation at a site (e.g. as in the case of confirmatory monitoring of risk-based remediation – the monitoring may have been required by a Director of Waste Management or voluntarily implemented by those remediating or responsible for remediating the site).

A NOM is not required on the basis of historical analytical data where site investigations or independent remediation were completed in the past and are not ongoing.

2) We provided a notice of migration to a property we suspected to be impacted from contamination originating from our property. Upon completion of remediation of the source property, we were able to confirm that contamination had not migrated to the neighbouring property. How do I have the migration notation on the ministry's Site Registry removed from the site record?

Once the notation has been posted to the Site Registry it will remain there. However, we request that you provide us with a statement from a qualified professional confirming that migration has not

occurred. We will add a statement to the notes field of the Site Registry notation indicating that we received advice from a qualified professional that contamination has not migrated from your property.

3) Is there a requirement to provide a notice of migration if the contaminant migration (or likely migration) is only taking place in soil vapour?

Yes.

4) During recent work on our property, which borders a commercial property which was the site of a former dry cleaner facility, chlorinated solvent contamination in groundwater was identified. The upgradient property is now occupied by other commercial activities. The adjacent property is not being investigated nor remediated at this time.

We will be contacting the upgradient property owners to let them know we found contamination coming from their property. Do we have a legal obligation to notify downgradient property owners that may be affected by further contaminant migration?

If we were to pursue a regulatory instrument, what is the requirement to delineate downgradient contamination (which is flowing through our site) since we are not the source site?

You have no obligation to provide notification of migration because the owners of sites affected by the migration of substances from a neighbouring site are not “responsible persons” under the *Environmental Management Act*. However, as a courtesy you may want to notify any known affected property owners downgradient of your property.

Unless the ministry requires it, you have no obligation to delineate downgradient contamination because you are not a “responsible person.”

Types of Contamination - Spills

If a spill of a regulated material occurs, the responsible person must immediately call the Provincial Emergency Program (PEP) at 1-800-663-3456. Environmental Emergency Response officers will base

their response on the determined level of risk posed by the spill. It is expected that all spills, whether reportable or not, must be adequately cleaned up by the person responsible.

1) When there is a spill or leak of petroleum hydrocarbons at a producing mine site, which ministry takes the lead regulatory role – the Ministry of Environment or the Ministry of Forests, Lands and Natural Resource Operations?

Both agencies have roles and responsibilities in this area.

Permits for producing mine sites under the *Mines Act* have requirements for spill contingency planning and response, so the Ministry of Forests, Lands and Natural Resource Operations is clearly involved.

The Ministry of Environment may also be involved in different phases.

Under the *Environmental Management Act's* (EMA) Spill Reporting Regulation, spills must be reported to the Provincial Emergency Program if the spill meets certain quantity criteria provided in the schedule in that Regulation. If the spill does not meet those criteria, then it would be unlikely that the Ministry of Environment would be engaged. If the spill reporting criteria are met and there is an emergency response, a Ministry of Environment Environmental Emergency Response Officer may become involved. Environmental Emergency Response Officers are not part of the Land Remediation Section and do not have a formal role in administering Parts 4 and 5 of EMA, both which deal with contaminated sites.

Once the emergency response is done, if there is no further cleanup after completion of the emergency response, then it is unlikely that the Land Remediation Section would be involved. However, if work proceeds to further clean up the site, then the Land Remediation Section may become involved, for example, when it receive notices of completion of independent remediation or applications for services such as the issuance of Certificates of Compliance.

Types of Contamination - Storage Tanks

For information regarding the regulation of residential heating oil storage tanks, refer to the Land Remediation Section's key topic "[Residential Heating Oil Storage Tanks](#)" on our website.