Ministry of Environment and Parks

# PROTOCOL 4
## FOR CONTAMINATED SITES

Establishing Local Background Concentrations in Soil

Version 15

Prepared pursuant to Section 64 of the
*Environmental Management Act*

Approved: Gwendolyn Lohbrunner, Director of Waste Management — June 10, 2026, Date

**Effective Date: June 19, 2026**

## Revision History

| Approval Date | Effective Date | Document Version | Notes |
|---|---|---|---|
| Oct 1, 1999 | Oct 1, 1999 | Version 1 | |
| Oct 12, 2010 | Oct 12, 2010 | Version 2 | |
| Nov. 1, 2017 | Nov. 1, 2017 | Version 9 | Stage 11 CSR amendment |
| Jan. 9, 2019 | Jan. 9, 2019 | Version 10 | Change to Section 4.0 |
| Feb. 1, 2021 | Feb. 1, 2021 | Version 11 | Align with Stage 13 CSR amendment, harmonize with Protocol 9 |
| May 13, 2021 | May 13, 2021 | Version 12 | Added definition of qualified professional to reflect *Professional Governance Act* |
| February 1, 2023 | February 1, 2023 | Version 13 | Revised definition of qualified professional |
| March 20, 2023 | March 1, 2023 | Version 14 | Align with Stage 14 CSR amendment |
| June 10, 2026 | June 19, 2026 | Version 15 | Revised to include circumstances where director's approval is not required |

## 1.0 Definitions

Terms defined in the *Environmental Management Act* (EMA) and the Contaminated Sites Regulation (CSR) apply to this protocol, with the addition of the following:

"**local background concentration**" means the naturally occurring concentration of a substance in soil in a geographic area established in accordance with this protocol.

**"potential contaminant of concern" [PCOC]** means any contaminant which might be expected to occur at a site based on the historical use of the site, whether that substance has been measured in any environmental medium or determined to exceed the numerical standards of the Contaminated Sites Regulation (CSR).

**"qualified professional"**, in relation to a duty or function under this protocol, means an individual who:

(a) is registered in British Columbia with a professional organization, acts under that organization's code of ethics and is subject to disciplinary action by that organization, and
(b) through suitable education, experience, accreditation and knowledge may reasonably be relied on to provide advice within the individual's area of expertise, which area of expertise is applicable to the duty or function.

## 2.0 Introduction

This protocol is made under the authority of EMA Section 64 (1)(c), (d) and 64 (2)(l).

It describes procedures for establishing local background concentrations in soil where naturally occurring substance concentrations exceed the applicable numerical soil standards of the Contaminated Sites Regulation (CSR). Local background concentrations are used in the investigation and remediation of a contaminated site and to carry out soil relocation.

## 3.0 Applying local background concentrations

### 3.1 Deciding if a site is a contaminated site or has been satisfactorily remediated

Soil that contains a substance at concentrations above the applicable numerical soil standard but below the local background concentration is not considered contaminated under Section 11 (3) of the CSR. Similarly, soil that has been remediated for a substance to concentrations above the applicable numerical soil standard for the site but below the local background concentration for that substance as determined under this protocol would be considered satisfactorily remediated under Section 17 (2) (b) of the CSR. This protocol is also used to determine the local background concentration for use in the application of risk-based standards for remediation under Sections 18 and 18.1 of the CSR.

### 3.2 Deciding if contaminated soil is suitable for relocation

Soil to be relocated from a site that contains a substance at concentrations above an applicable numerical soil standard for the receiving site, but below the local background concentration for that substance at the receiving site as determined under this protocol, is considered acceptable for deposit at the receiving site in accordance with Section 41 (2) (b) of the CSR.

## 4.0 Options for establishing local background concentrations

Where substances occur naturally in soil at elevated concentrations, a local background concentration for that substance can be established using one of the options described below.

Background concentrations in soil for Environmental Management Areas must be established using Option 1.

### 4.1 Option 1 – Using regional estimates of background concentrations in soil

Local background concentrations of substances in soil can be established using ministry data for either a region or a locale. This data is presented in two ways:

- Table 1 provides regional estimates of background concentrations in soil; and
- The Background Concentrations Database provides the individual data points for each sample location, sorted by locales and regions.

The regional background concentration estimates in soil are considered representative of local background concentrations in soil at any site located in a particular region. The Table 1 estimates are based on near surface soil samples obtained at ministry background sites. These regional background estimates may also be applied to specific geological units at a site where appropriate.

Regional boundaries are shown in Figure 1. For sites located within the Metro Vancouver area (see Figure 2), the Metro Vancouver area regional estimates of background concentrations in soil applies. Sites located within the Lower Mainland but outside the Metro Vancouver area, should use the Region 2 regional estimates of background concentrations in soil.

Data provided in the Background Concentrations Database may also be used to determine local background concentrations in soil for a particular locale. Due to limited data for individual locales, these concentrations must be calculated as the median of all available substance-specific data for the locale.

#### *4.1.1 Reporting requirements*

Establishing a local background concentration in soil using Option 1 does not require approval from the director.

Investigation reports prepared in support of applications to the ministry must clearly indicate the use of this approach and the local background concentrations in soil that were applied. Establishment of a local background concentration must be referenced in the Summary of Site Condition and Schedule C of any certification document issued for the site.

For substances not listed in Table 1, site-specific local background concentrations in soil must be established using Option 2, below.

### 4.2 Option 2 – Using supplemental data and reference sites

This option allows for the calculation of site-specific local background concentrations in soil using supplemental data and reference sites by either:

**Option 2a**. Using site-specific concentration data collected from direct background soil sampling at the site of interest supplemented with relevant data obtained from literature

**Option 2b**. Direct background soil sampling conducted at an appropriate reference site relevant to the site of interest.

Establishing a local background concentration in soil using Option 2 requires director's approval unless all criteria indicated in section 4.2.2 are met.

#### *4.2.1 Procedures*

### *Option 2a - Establishing local background concentrations in soil based on supplemental data*

Ministry background soil data can be supplemented with other local background concentrations established near the site of interest, relevant background data obtained from reports or databases available from other sources such as the National Geological Survey of Canada and the BC Ministry of Energy and Mines Mining Survey data, and from direct background soil sampling at the site of interest using the soil data collection and assessment requirements outlined in Option 2b, below.

### *Option 2b – Establishing local background concentrations in soil using reference sites*

Site-specific local background concentrations in soil may be established by comparing site characteristics to a representative background reference site or sites. The emphasis in the reference site procedure is on the estimation of representative substance concentrations in soil that can be shown to be attributable solely to natural origin (i.e., not due to anthropogenic sources). This is achieved by careful site selection, analysis and comparison of reference site concentrations in soil to those observed at the site of interest.

**Reference Site Selection**

The reference site must be similar to the site of interest with respect to:

(a) geographical characteristics (e.g., location, topography, size/area, etc.),
(b) soil physical/chemical characteristics (see soil maps, Geological Survey of Canada information, etc.),
(c) hydrology and hydrogeology, and
(d) soil sampling depth within the same geological unit.

Reference sites must:

(a) not be impacted by contaminant sources,
(b) show no evidence of anthropogenic impact (e.g., vegetation stress).

Reference site(s) may be identified at unimpacted areas of the subject property and will be considered on a case-by-case basis.

**Soil Data Collection and Assessment**

Once a reference site has been selected, the following data collection requirements must be met:

(a) samples must be collected from within native materials (i.e., not from the fill layer);
(b) samples should be horizontally distributed across the site and collected from the same geological unit and similar depth as the samples from the site of interest;

(c) the number of samples used to calculate a local background concentration should be reflective of the size of the site; and
(d) Soil sampling must be performed in accordance with the latest version of the BC Field Sampling Manual.

Soil samples taken from the reference site and the site of interest should be subjected to identical analytical methods, using the same analytical laboratory whenever possible. Samples must be analyzed using ministry approved analytical methods as detailed in the latest version of the BC Environmental Laboratory Manual or alternate methods acceptable to the director.

Soil samples must be analyzed for all potential contaminants of concern relevant to the site of interest. Samples must be analyzed only by laboratories registered under the Environmental Data Quality Assurance Regulation.

**Calculation of Local Background Concentrations**

Where data are demonstrated to represent a single statistical population, the local background concentration in soil for a substance is the 95$^{th}$ percentile concentration of the data set. Outliers must be identified using statistical methods and removed from the dataset. If duplicates are included in the dataset, the average concentration of the duplicates should be used in the background calculation and counted as one sample.

For more information on statistics for contaminated sites, refer to Technical Guidance 12.

#### *4.2.2 Circumstances not requiring director's approval*

Director's approval for establishing local background concentrations in soil using Option 2 is not required prior to applying for a certification document or director's release notice in the following circumstances:

- The substance is not a potential contaminant of concern at the reference site or the site of interest; and
    - There are no detectable concentrations of hydrocarbons or volatile organic compounds in the samples used to calculate the background concentration; and
    - The substance is not present above CSR numerical soil standards in fill material.
- The site of interest is located within a known mineralized area, as determined by a qualified professional using verifiable records such as government databases, geological assessments or maps; and it has not been previously mined or disturbed.

Despite the circumstances described in this section, director's approval is required when establishing local background concentrations in soil using Option 2 for the purpose of relocating soil.

Applications to the ministry for certification documents and director's release notices must indicate that local background concentrations were applied and justify why director's approval is not required.

The rationale and methods, including the information listed in Section 4.2.3 used to determine local background concentrations in soil, must be provided in a dedicated section of the applicable final report(s). Establishment of a local background concentration must be referenced in the Summary of Site Condition report and Schedule C of any certification documents issued for the site.

#### *4.2.3 Reporting requirements*

Where a director's approval is required, an application must include a Contaminated Sites Services Application form, Summary of Site Condition and a full report detailing the rationale and methods used to determine local background concentrations in soil. This report must be a stand-alone document. that includes the following detailed information:

a) identification of the region in which the site is located, or in the case of proposed soil relocation, the region of the proposed receiving site,
b) the selection and location of the reference site(s),
c) contaminants of concern considered (including the presence of natural mineralization),
d) soil sampling locations and depths used (including a map showing sampling locations),
e) analytical results that demonstrate the reference samples are not impacted by anthropogenic activity,
f) table(s) with the depth, geological unit and sample concentration for all the samples being used in the site-specific local background calculation,
g) statistical analysis that demonstrates the background data fall within a single population
h) the proposed background concentration for each stratigraphic unit,
i) conclusions based on the assessment of reference site background soil quality and the comparison of reference site background soil quality to the soil quality of the site of interest.

Background concentrations do not generally follow a discernible pattern across a site. If a pattern is present in the data, an explanation must be provided.

## 5.0 Alternate approaches

Scientifically defensible modifications to the options outlined in this protocol for establishing background concentrations in soil may be considered by the director. Such requests must be submitted for a director's decision and be accompanied by:

- a completed Contaminated Sites Services Application form;
- a Summary of Site Condition; and
- a supporting technical report prepared by a qualified professional that, at a minimum, meets the intent, technical rigor and documentation requirements of this protocol.

Applications for a director's approval on local background concentrations in soil are subject to ministry service fees as indicated in Schedule 3 of the CSR.

**Table 1. Regional estimates for background concentrations in soil for inorganic substances[1]**

| Substance | Region 1 Vancouver Island | Region 2 Lower Mainland | Metro Vancouver[2] | Region 3/8 Thompson/Nicola/ Okanagan | Region 4 Kootenay[3] | Region 5 Cariboo | Region 6 Skeena | Region 7 Omineca/ Peace |
|---|---|---|---|---|---|---|---|---|
| aluminium | 55 000 | 35 000 | 35 000 | 30 000 | 25 000 | 25 000 | 40 000 | 40 000 |
| antimony | (4) | (4) | (4) | (4) | (4) | (4) | (4) | (4) |
| arsenic | (4) | 8.5 | 8.5 | 15 | (4) | 10 | 10 | 10 |
| barium | 250 | 150 | 90 | 200 | 350 | 250 | 300 | 500 |
| beryllium | 0.7 | 0.7 | 0.7 | 0.5 | 0.8 | 0.3 | 0.6 | 1 |
| boron | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |
| cadmium | 0.95 | (0.4) | (0.4) | (0.4) | (0.4) | (0.4) | (0.4) | (0.4) |
| Total chromium | 65 | 55 | 50 | 70 | 35 | 100 | 40 | 50 |
| cobalt | 30 | 15 | 15 | 20 | 15 | 20 | 15 | 25 |
| copper | 100 | 75 | 150 | 75 | 35 | 60 | 50 | 70 |
| iron | 70 000 | 30 000 | 30 000 | 30 000 | 30 000 | 30 000 | 30 000 | 40 000 |
| lead | 40 | 200 | 300 | 15 | 120 | 15 | 20 | 25 |
| manganese | 5 000 | 900 | 1 000 | 1 000 | 2 000 | 850 | 1 500 | 1 500 |
| Inorganic mercury | 0.15 | 0.3 | 0.35 | 0.075 | 0.085 | 0.09 | 0.15 | 0.09 |
| molybdenum | (1) | 4 | 6 | 2 | (1) | (1) | 3 | 3 |
| nickel | 50 | 75 | 40 | 85 | 50 | 200 | 40 | 60 |
| selenium | (4) | (4) | (4) | (4) | (4) | (4) | (4) | (4) |
| silver | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |
| strontium | 100 | 60 | 55 | 250 | 150 | 250 | 100 | 70 |
| sulfur | 1 000 | 2 000 | 3 000 | 550 | 950 | 800 | 2 500 | 450 |
| tin | (4) | (4) | (4) | (4) | (4) | (4) | (4) | (4) |
| vanadium | 200 | 80 | 75 | 85 | 40 | 75 | 85 | 95 |
| zinc | 150 | 100 | 90 | 100 | 200 | 85 | 150 | 150 |

**Footnotes:**

1. Units are in µg/g.
2. Listed estimates for local background concentrations in soil may be used within the Metro Vancouver area only. The Metro Vancouver area (see Figure 2) includes the University of British Columbia, Stanley Park, Queen Elizabeth Park, Richmond West, Richmond Central, Burnaby Lake Regional Park, Burnaby North, North Vancouver, New Westminster, and Coquitlam.
3. All results from Castlegar and Trail locales were removed from the data set as they are related to anthropogenic contamination. The regional estimate for lead has been established by a director.

**Figure 1. Boundaries to determine regional background concentrations in soil**

**Figure 2. Geographic limits for Metro Vancouver area**