

## Protocol 4: Determining Background Soil Quality

May 2018

Stakeholder Comments / Recommendations	Ministry Response(s)
References Section 46.1 (a) (iv) of the Regulation, and appears to be in error	This has been corrected in the final version of the protocol.
In general, we recommend that the Ministry be clearer regarding the ability to set background levels for non-point source anthropogenic sources on a development site	The ministry endeavours to provide as much clarity as possible given the range of variables that can occur on a site.
Option 1: Where does the median background soil quality estimate come from (not Table 1)? From attached dataset?	The responsible party can calculate the median background soil quality estimate from the attached dataset for the locale in which the site is located. The ministry has not calculated median values for each individual locale.
pg. 2 (pg. 3 in pdf): it states, “Substances originating from natural conditions or anthropogenic non-point source contamination may be eligible (emphasis added) for a background release...” but “Substances that originate from anthropogenic point source contamination are not eligible”. This is contradictory. Suggest revising the latter to “anthropogenic point source contamination...”	The wording was changed to provide greater clarity to the reader.
Option 2b: reference sites can't be located next to contaminant point sources, does this mean not next to a contaminated site?	The wording has been changed to indicate reference sites must not be impacted by contaminant sources.
Option 2b, pg. 4 (pg. 5 in pdf): in the paragraph that states “The reference site must closely match...” we do not agree with the inclusion of some of those, namely, size/area and hydrology (which is difficult to evaluate...and any obvious differences in hydrology would be reflected in soil physical/chemical characteristics).	The ministry agrees that obvious differences in hydrology would be reflected in the soil physical/chemical characteristics; however, surface hydrology should still be discussed to ensure that the reference site is acceptable. Similarly, the size/area of a site would not necessarily reflect differences in geology between the reference and subject site but should still be discussed to facilitate a better understanding of the reference site(s) used
pg. 7 (pg. 8 in pdf): it states that background for heavy metals will not be considered for the Castlegar and Trail locales due to enrichment from mining activities. However, if there is an actual or suspected release from Oil and Gas activities in any of these two locales, then metals background from these locales should be required in order to prove that any elevated heavy metal concentration is not from Oil and Gas activities. The metals enrichment will mainly be due to aerial deposition from the smelter stack. Since this impact is so wide-spread, it should be considered anthropogenic background and proponents should	The ministry does not agree that elevated levels of contaminants due to industrial activity is reflective of true background concentrations. Heavy metals will continue to not be considered for background in the Castlegar and Trail locales.

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<p>not have to clean up soil to values below anthropogenic background. This requirement, if implemented as proposed, would make remediation of sites in these two locales more complex and costly for proponents, effectively burdening this real estate with unreasonable heavy metals criteria and making beneficial reuse of these sites much more difficult to achieve. By way of example, in Sudbury, Ontario, we understand that the local MOE office has taken the more practical approach that cleanup of soil to nickel, copper and arsenic levels numeric criteria is not possible, due to nickel smelting operations in this area.</p>	
<p>Is any background data available specifically on hexavalent chromium?</p>	<p>Hexavalent chromium was not analyzed in the soil samples collected during the original analysis (using aqua regia and/or nitric perchloric methods) or the re-analysis (using the SALM method). Analysis of speciated metals may be considered for the next update.</p>
<p>Request for clarity in Region Figure - Should be clearer in terms of the defined area (e.g., latitude and longitude).</p>	<p>The figure has been updated to provide clarity.</p>
<p>Reference to section 46.1(a)(iv) of the Regulation appears to be an error. The Regulation does not contain such a section [note that section 46.1(a)(iv) is also referred in Option 2b and section 5.0].</p> <p>The reference in the Protocol should be 45(3)(b) of the Regulation.</p>	<p>The typo has been corrected in the final version of the protocol.</p>
<p>For consistency with Section 2.0 Introduction and to meet the intent of allowing background release for non-point source anthropogenic sources, the last sentence should be amended to read “Substances that originate from anthropogenic point sources are not eligible for a background release.”</p>	<p>The ministry edited this section to make this point clearer.</p>
<p>Incorrect reference to Form X -The last paragraph indicates that use of regional background soil quality estimates or median estimates based on the locale approach do not require approval of the Director. However, the next sentence indicates that approval can be achieved by submitting site investigation reports to the ministry which indicate that background soil quality estimates were used. Further, note 1 in Figure 1</p>	<p>The reference to Form X in the footnote in Figure 1 has been removed.</p>

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<p>indicates that a Form X (Appendix 2) needs to be completed for approval by the Director for use of a background regional estimate or locale within the region.</p> <p>If, as indicated in the first sentence, approval is not required to use the Table 1 regional background estimates or median estimate for the locale approach, then why is approval via submission of reports or a form required?</p>	
<p>The current version of Protocol 4 allows use of the Table 1. Regional Background Soil Quality Estimates to a maximum depth of 3m from the soil surface at a site. Draft 9 of the Protocol limits the depth to 1m. While the reasons for limiting the sample depth based on the supporting data for the regional estimates is understood (sample depths for the data set are less than 1m), there are instances where the non-point source anthropogenic or natural background extends to deeper depths in the soil stratum.</p> <p>If the stratigraphy at a site supports applying the regional estimates to deeper depths will the ministry consider approval under Option 1?</p>	<p>The ministry decided that Table 1 can be applied to any depth provided your site does not have deep rooted plants or burrowing animals deeper than 1 m. The wording has been changed in the final version of Protocol 4.</p>
<p>Regional background values are proposed to be limited to soils less than 1 m depth</p>	<p>See response to one metre depth issue above.</p>
<p>A large majority of the draft background values are less than the new “Omnibus” standards due to become effective November 1, 2017</p>	<p>This ministry has noted this.</p>
<p>Include a definition of “anthropogenic sources” and “non-point anthropogenic sources” and “anthropogenic release.”</p> <p>Ambiguity was noted in the following:</p> <ul style="list-style-type: none"> <li>• see box at end of Section 2.0;</li> <li>• Section 4.0 first paragraph;</li> <li>• Section 4.2.2 “Option 2b - Reference site procedure” first paragraph</li> </ul>	<p>The ministry has noted this.</p>
<p>Is reference to section 46.1 (a) (iv) of the Regulation intended to reference 45(3)b or is there a new version of the Regulation planned</p>	<p>This has been corrected in the final version.</p>
<p>Footnote 1 on Figure 1 is confusing – there is a first-time</p>	<p>The reference to Form X has been removed from the final version and</p>

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<p>reference to Form X and appendix 2 but there is no reference to appendix 1.</p>	<p>references to appendices have been updated.</p>
<p>1st paragraph: It is stated that “Table 1 is based on the Strong Acid Leachable Metals (SALM) digestion method.” However, for sodium we understand that the saturated paste method is referenced for the omnibus sodium standards. With such a method, are there regional data available for sodium?</p> <p>2nd Paragraph: “regional background estimates may only be used as determinants of background soil quality to a maximum depth of 1m from ground surface at a site.” This is likely to be an issue for many sites where deeper soils exceed standards but are representative of background. It could also be problematic for disposal of soils from construction sites where excavations are greater than 1 m depth, or where fill materials exceed 1 m depth. Perhaps consider 1) expanding the MOE database by obtaining deeper samples, 2) expanding database by including data available from DSI’s submitted to MOE 3) demonstrate that soil less than 1 m depth is similar to soil greater than 1 m depth.</p>	<p>Sodium results were removed from Table 1 as these values were based on the SALM digestion method. Regional data for sodium using the saturated paste method are not available.</p>
<p>3rd Paragraph: Figure 3 needs to be revised to include scale, north arrow, geographical names or other features such as latitude/longitude ranges, etc. We suggest that P4 could use references in the figures and the text for those not familiar with the Lower Mainland.</p>	<p>See response to one metre depth issue above.</p>
<p>4th Paragraph: “Data provided for a particular locale may also be used as representative of soil background at a site located in that locale.” Can the data from a few locales closet to a site be used for that site, specifically if the site is on a regional boundary?</p> <p>“However, due to the limited number of data points (i.e. sampling results) available for each locale, the background soil estimate must be calculated using the median value of the data.” Calculating the median will result in lower background</p>	<p>Agreed.</p> <p>Within the capture area of a named locale, if you want to argue that more locales applicable this would be considered a modification of local reference site procedure and would be considered on a case by case basis. All locales that match would need to be taken into account, not just ones that benefit the responsible party. This approach would</p>

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<p>values than using the 95th percentile. This may result in an increased level of effort with a possible uncertain outcome – practitioners may therefore be reluctant to use P4 Option 2. Can this be augmented with local results collected by practitioner, and the 95th percentile applied? 5th Paragraph: should reference “28” inorganic substances in Table 1 rather than “17”.</p>	<p>require director approval.</p>
<p>In Option 2, two sub-options are provided as per below: Option 2a. Augmenting ministry background soil data relevant to the site with additional pertinent data obtained from the literature and/or  Option 2b. Direct background soil sampling conducted at an appropriate local reference site relevant to the site in question. In the wording, it is not clear whether option 2a can include elements of Option 2b or not. “and/or” is used but overall this is confusing.</p> <p>Given the limited value of Table 1 as discussed below, perhaps a step process should be considered rather than option selection. Step 1 would, for example, refer to Table 1; step 2 would involve collecting data from other sources (i.e., GSC); and Step 3 would involve collecting and sampling reference locations on site, and then off site if necessary.<sup>4</sup> When using Option 2, a standalone report must be submitted for approval by the Director. Such requirements are likely to increase the time and costs of an investigation. Alternatives processes should be considered as acceptable (e.g., perhaps the CSAP performance review process could accommodate this).</p>	<p>Updated Table 1 – sodium is now removed. Changed relevant text to indicate that 27 inorganic substances are available in Table 1.</p> <p>The ministry has noted this.</p>
<p>We expect that gaining approval to sample off-site properties that serve as reference sites will be onerous in many cases, leading to time delays and added cost. We suggest that P4 should recognize explicitly that there may be locations on the Site, itself, that can serve as suitable reference sites. Given the limited applicability of Option 1, some explicit language</p>	<p>Agreed. On-site reference locations have been identified as an option in the final version of Protocol 4.</p>

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<p>indicating the acceptability of on-site locations should be mentioned. We note that, after going through the process of selecting an off-site reference location, there may be a real risk that substances at the reference site are in low concentrations but are not necessarily representative of regional background. In such cases, the practitioner may choose to sample additional reference sites at additional cost, or simply give up. Are there alternative processes that can be considered? “Soil sampling must be performed in accordance with ministry requirements.” We note that the new draft P4 no longer makes reference to TG16.</p>	
<p>We note that there is a requirement for “a complete history of land use(s) at the reference site.” The wording suggests the need for a complete Stage 1 PSI, which is rather onerous, particularly for off-site reference sites. Is that what is intended? We note that the practitioner is required to describe “the statistical significance of the results obtained”. This makes sense intuitively; however, given that statistical power increases with the number of data points (and samples) obtained, further guidance would be appreciated on this issue (e.g., can P4 specify a minimum number of samples to use in calculating a median or 95th percentile?). This would assist the practitioner in making the decision to use or not use Option 2 as a cost-effective approach to address background.</p>	<p>The selection of an appropriate reference site should be thorough and to a level of intensity similar to that of a Stage 1 PSI to ensure that the site is acceptable for use as a reference site. This is outlined in Section 4.2.3 of the protocol.</p>
<p>We note that ministry fees will be charged to review the standalone report for Option 2. Again, this will add costs to the process, potentially making it unpalatable and possibly unworkable.</p>	<p>The “Direct Determination of Local Background Soil Quality” report may be a distinct chapter of another report or a stand alone document. Regardless, service fees detailed in Schedule 3 will apply.</p>
<p>P4 makes reference to risks to the biogenic zone from shallow soil concentrations. We suggest that the biogenic zone depth is not necessarily relevant to the composition of overburden soils deposited by geologic processes. If the same geologic/stratigraphic unit is sampled, we would expect the metals concentrations to be distributed throughout the deposit, regardless of depth. In such cases, the applicability of the Table 1 background values should not be limited to a depth of one</p>	<p>See response to one metre depth issue above.</p>

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<p>metre. We recommend that the applicable depth remain at 3 m, and suggest that an effort be made to acquire data from greater depths.</p>	
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