

## Technical Guidance 24: Site-Specific Numerical Soil Standards Model Parameters

May 2018

Stakeholder Comments / Recommendations	Ministry Response(s)
This [the model] should be referenced, and be listed Reference # 1 in the list of references. Current reference list numbering to be adjusted	The reference to the Groundwater Protection Model (GPM) is now hyperlinked in TG24(standard ministry style guide).
Hyperlink needed to TG 13.	Hyperlink added.
Consider removing Appendix 2.	Appendix 2 is an actual screenshot from the GPM and provides the definitions for the various concentrations. Others have commented that the figure is useful.
Add the transport distance “to receptor” to Table 1	Table 1 has been modified to include the transport distance to receptor
Do we need to list literature values? or reference where they are listed? See Section 3.2 below	All site-specific parameter values need to be listed in the documentation of the site specific soil standards along with methodology and supporting data (see P2, Section 5.2 for documentation requirements).
I think this TG should specify how to handle a range of values (literature or site-specific) – e.g., mean, median, most conservative, seasonal, max/min. etc. Specific examples of where this may be important highlighted below.	Please refer to Reference 1 in TG 24 which includes the sensitivity analysis of model parameters. The ministry relies on professional judgement when evaluating for the most representative site-specific value. TG24 also specifies that where the values cannot be reliably determined, the default model parameters values should be used.
Appendix 4 flowchart refers to “Complete documentation for SSS” - do we need a section that explains what documentation is required/expected?	Section 5.2 of P2 contains the documentation requirements.
First mention of this – what is the difference between the GPM method and Modified GPM method, and does this TG apply to both methods?	Section 1.0 and 2.0 of TG24 refer to the GPM (i.e. the ministry's groundwater model) itself. Section 3.0 describes the method where one can modify the parameters in the GPM. TG24 applies to both the Modified GPM Method and the Leachate Method as described in P2. A sentence has been added to the introduction to provide further clarity.
Set off-equation variables (e.g. ET and RO) in brackets for clarity.	The variables will not be listed in brackets as TG 24 is written in accordance with ministry style guide to maintain consistency across all guidance documents.
Does MoE have any guidance on what they would consider an acceptable method for site specific infiltration (e.g., ASTM D3385, or would other methods be acceptable)?	No, the ministry does not provide any guidance on site specific infiltration. Please refer to Reference 2 in TG 24 for how the ministry evaluated infiltration.
Table 1 in P2 doesn't seem to indicate that a site specific infiltration rate can be used (only default or look up table). Suggest modifying Table 1	The document has been modified so that a site-specific infiltration may be used and submitted for a director's decision.

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in P2 to indicate that a site specific infiltration rate can be used with Director's approval.	
You would normally find a range of values, sometimes pretty big for sourced literature values. Would any value that is the most beneficial for the site be accepted if it is obtained from a published source?	Literature values are only allowed for porosity parameters, which are not very sensitive model parameters. Thus, as long as the referenced value falls within the acceptable range, then a published sourced literature value is considered acceptable.
PCP should be defined - I assume this is for pentachlorophenol-confusing because PCP is not a hydrogeological parameter.	Added in pentachlorophenol to add clarity.
Was not available for reference. Hyperlink? Is this a new Protocol?	Hyperlink added to document. Protocol 28 is a new protocol, which describes the derivation method applied in standards update, including the matrix soil to groundwater standards.
Use min, max or average depth to water table? What about in case of tidally influenced areas – need to use smallest D? Should provide some guidance on how to evaluate an acceptable value for this sensitive parameter.	Please refer to Reference 1, which includes the sensitivity analysis. The ministry relies on professional judgement when evaluating for the most representative site-specific value.
Change the depth to water table abbreviation from d to D.	To be consistent with P28, d is the symbol for depth to water table. Both TG24 and P2 have been checked for consistency.
Protocol 16 link needs to be re-formatted.	Sentence has been shortened and link reformatted
No standards for EPH and VH for defining petroleum hydrocarbon source? LEPHs and HEPHs (with EPH10-19 and EPH19-32 used in accordance with Directors guidance on equivalency of extractable petroleum hydrocarbon (EPH))	Correct. VHs and EPHs are used as surrogates as described in Reference 3.
Removal of "in addition to a petroleum hydrocarbon source".	The ministry kept this sentence for clarity.
Why couldn't the inorganic source definition be iterative? i.e., first step source definition using default, derive a first iteration SSS using that (modifying other parameters, e.g., infiltration), then use the first iteration SSS to redefine the source area to re-derive the SSS? One of the problems with the current model/approach is achieving delineation in the first place, or parameters with relatively low standards. A desirable benefit of using the model would be to allow modification of the soil standard used to define the area of contamination. This is most relevant at sites with relatively large depth to groundwater, and/or where numeric standards are very low (e.g., benzene) and/or nearing background conditions and/or for some parameters where you don't necessarily want to be drilling directly in the source area (e.g., VOC). At	Section 3.3 of TG24 and Section 5.1.1 of P2 has added language to include the possibility of iteration.

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least provide opportunity for iterative approach on sites where there is no or little gw plume observed.	
How are other COCs based? Delineated to extent of Schedule 3.1 generic numerical exceedances I presume.	Yes, source dimensions are delineated to the numerical standards.
<p>What would these be – suggest specifying?</p> <ul style="list-style-type: none"> <li>• Cyanide</li> <li>• DIPA</li> <li>• Ethylene glycol</li> <li>• Methanol</li> <li>• Nonyphenol/nonyphenol ethoxylates</li> <li>• PFOS</li> <li>• Phenol</li> <li>• Sulfolane?</li> </ul>	The ministry prefers to not specify substances in these categories, similar to not specifying specific PHCs and metals. Keeping the categories broad provides flexibility if the ministry adds new matrix standards..
“Alternative, scientifically defensible values be available for modifying these parameters, an application for a director’s approval” . This wording is different in P2 or actually doesn’t exist in P2.	Both documents have been modified to provide clarity and consistency.
Why not allow modification of the number of days frozen (e.g., data collected on a site-specific basis?)	Given that a site-specific <b>annual</b> days frozen is often difficult to determine given variables such as climate and ground temperature, using the default is an easier method and provides more relief (less biodegradation when days frozen > 0 days). The number of days frozen must be modified when altering the biodegradation half-life and must be submitted for a director’s decision.
Consider adding all Protocol, TG references – or change title to say Non-Government References or Discussion papers	A hyperlink is provided in the text referencing any ministry documents. The reference section at the end provides bibliographic information on supporting documentation used by the ministry. This style is consistent with other technical guidance documents.
Use same referencing method as other Protocols	A hyperlink is provided in the text referencing any ministry documents. The reference section at the end provides bibliographic information on supporting documentation used by the ministry. This style is consistent with other technical guidance documents.
Z = source thickness - Should be “depth” as per Table 1, Appendix 3	Changed to source depth

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and Protocol	
Formatting and spelling errors in Appendix 2 need to be addressed; caused by conversion from PDF	Appendix 2 was reviewed for errors.
Consider removing Appendix 2 –not helpful and it distracts from the TG objective – maybe there is a better schematic that could be used here.	Appendix 2 is an actual screenshot from the GPM and provides the definitions for the various concentrations. Others have commented that the figure is useful.
<p>Appendix 3- How to measure model parameters should be defined elsewhere Eg.:</p> <p>lab method for foc (is laboratory TOC okay? measured outside the source zone? average? minimum?)</p> <p>average groundwater or soil pH, in the source area or at the d/g property line or something else?</p> <p>how to handles ranges in literature for porosity?</p>	Please refer to the TG 24 where each parameter is defined. The ministry relies on professional judgement when evaluating for the most representative site-specific value.
Does the reference to (organic) mean that the model is only applicable to concentrations of organic compounds? Suggest adding a notes section below to clarify the difference. For the PCP as well.	Footnotes have been added to provide more clarity.
Appendix 3 parameter set, should be “Category” as per Page 1, 2 <sup>nd</sup> column first paragraph	Changed to Category.
Should be “Defined Parameter”	Changed to Parameter
Protocol 2, Table 2 column heading for this list is “Parameter” suggest modifying to match Protocol 2 or to “Parameter Symbol”	Changed to Parameter
Depth to water table, Aquifer thickness - These two definitions differ from Protocol 2, Table 2	To consistent with P28, d is the symbol for depth to water table. Both documents have been modified to be consistent.
TG24 Table 1 says “Biodegradation rate” is the parameter while Appendix 3 says Half-life, determine most appropriate term, & use the same term for consistency throughout	Changed to half-life in both documents
Table needs to be properly formatted; many conversion errors from PDF	Appendix 3 was reviewed for errors.
Add “Example of”....”Approach”	Changed as suggested.
Probably best to make this very generic and just say determine applicable distance to receptor for SSS.	There are different requirements for determining “distance to receptor” for different water uses, so a generic box does not provide enough guidance.

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<p>Why is the P/L important in the context of whether a groundwater to surface water pathway exists? If the AW plume extends past the P/L, but doesn't extend to the point of compliance, and is found to be stable, why couldn't you modify distance to receptor to the point of compliance? Otherwise, you may be calculating a SSS that could drive remediation of a source zone where there is not an ecological pathway</p>	<p>Given that P2 provides a new numerical site-specific soil standard for that particular source site, the protocol does not provide the ability to contaminate a neighbouring affected parcel that is subject to a numerical standard. This otherwise allows contamination onto the neighbour's property. Those arguments are acceptable for risk assessment, but not for setting a new numerical standard.</p>
<p>If plume exists and is shown to be stable, and there is going to be a risk control of no DW on your property, why can't the distance to receptor be modified to the property boundary?</p>	<p>Given that P2 provides a new numerical site-specific soil standard for that particular source site, the protocol does not provide the ability to contaminate the underlying aquifer when IW/LW/DW apply. Those arguments are acceptable for risk assessment, but not for setting a new numerical standard.</p>
<p>Editorial changes provided in track changes</p>	<p>Where the suggestions provided greater clarity, the changes were made.</p>
<p>This document provides helpful guidance to professionals for determining model parameters in deriving site-specific numerical soil standards under Protocol 2 and we support it.</p>	<p>The ministry appreciates the feedback.</p>