

# Omnibus Updating of CSR Standards Draft Discussion Documents

## Land Remediation Response to Stakeholder Comment

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## Introduction

In preparation of the *Contaminated Sites Regulation* Omnibus Update, the Land Remediation Section released the following 11 Draft Discussion Documents for review and comment on July 7<sup>th</sup>, 2015, summarizing the proposed changes to the standards of the Regulation:

- [CSR Omnibus Updating: Overview](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 4](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 5 Environmental Protection Standards](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 5 Human Health Protection Standards](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 5 Soil to Water Pathway Standards Appendix to Schedule 5](#)
- [CSR Omnibus Updating: Proposed High Density Residential Soil Standards](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 6](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 7](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 9](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 10](#)
- [CSR Omnibus Updating: Proposed Amendments to Schedule 11](#)

The comment period was open from July 7 to August 28, 2015. This document contains the comments submitted by stakeholders, and the Land Remediation section's responses organized by the discussion documents. We would like to thank the following organizations for their submissions:

*BC Environmental Laboratory Technical Advisory Committee (BCELTAC)*  
*BC Ministry of Health*  
*BC Oil and Gas Commission*  
*Business Council of British Columbia*  
*Canadian Association of Petroleum Producers*  
*Canadian Fuels Association*  
*CARO Analytical Services*  
*Contaminated Sites Approved Professionals (CSAP)*  
*Environment Canada*  
*Fisheries and Oceans Canada (DFO)*

*Health Canada*  
*Metro Vancouver*  
*Science Advisory Board for Contaminated Sites in British Columbia (SABCS)*  
*SNC Lavelin*  
*City of Surrey*  
*Synergy Aspen*  
*Teck*  
*Urban Development Institute*  
*City of Vancouver*

General Comments		
No.	Stakeholder Comment	Land Remediation Response
1	Is the Ministry considering providing guidelines or standards relative to natural source zone depletion including LNAPL and to the polar metabolites of hydrocarbons referred to as TPH in overall assessment of petroleum hydrocarbon distribution and fate? In general, SABCS notes that among the technical guidances that are cited as being affected by the standards, Technical Guidance 22 on monitored natural attenuation is not currently included. Since it is likely that TG22 may come into force during the next five years we would recommend that consequential changes to the standard Schedule X inherent in natural attenuation (e.g. TPH) be considered	Ministry guidance on monitored natural attenuation is draft and remains under development. It is considered best to incorporate any potential consequential changes to standards once the guidance is completed. Accordingly, this issue will be considered as part of the next cycle revisions.
2	24 hrs per day, 7 days a week, 26 weeks, for 80 years; very stringent scenarios o Unrealistic expectation/estimate of land utility for human health exposure	MOE agrees that as the proposed derived wildlands standard is new, the exposure term for wildlands use is currently conservative by design and may be revisited during the next cycle of CSR updates.
3	Do any of the standards include bioaccumulation?	No, however some TRVs used in derivation may incorporate consideration of bioaccumulation.
4	When background exists what will be the relief on the standards?	The CSST protocol includes a "background check" for draft standards. If background is known (e.g. BC Provincial estimates for metals is available) and if a tox based standard is less than (more stringent) than Provincial background, the draft standard is adjusted to equal Provincial background.
5	The actual numerical standards that will come out of the Stage 10 amendments have yet to be determined. When does MOE expect to develop the new/updated standards and will our agency have an opportunity to review them before they are finalized?	Project schedule currently calls for draft standards to be available circa 1st week of December, 2015. Draft standards will be provided to some agencies for review.
6	Our agency supports the decision to adopt Health Canada's exposure duration terms in the next cycle of amendments to the CSR. Be aware that, in the meantime, there will be inconsistencies with HHRAs for environmental assessments and federal contaminated sites, where Health Canada ETs are recommended. Also, Health Canada does not specify ETs for all land use scenarios in the CSR (e.g. HDR, WLS)	Cautionary advice is duly noted.
7	Concern that the rigidity of the draft requirements is not commensurate with bona fide environmental risk at sites	The level of protection accorded by the CSR environmental protection standards is a MoE policy decision. MoE believes the environmental protection standards must be: 1. generally applicable throughout the Province, and 2. appropriately conservative by design  It is important to realize the CSR environmental quality standards are based on generally applicable defined exposure scenarios. The CSR standards do not represent, and are not intended to be equivalent to, site-specific risk assessment.
8	Proposed standards are not 'go forward,' as standards will apply retroactively o Not just dealing with future sites o It is unknown at this point what the increased frequency and intensity of assessments/remediation these draft standards will entail i.e. Potential for significantly increased costs, Impact on industry liability/LLR	Ministry will recommend a 6 month to 1 year "coming into force" transition period for implementing new stage 10 standards. Note that CSST protocol is designed to produce scientifically defensible standards and does not consider economic consequences of the standards - this is a separate issue for the consideration of the Minister.
9	Other potential negative impacts: o Increased industry footprint by virtue of increased assessments (trucks on road etc.)	The CSST protocol does not address relative ancillary risk associated with remediation of a contaminated site (such as increased trucking of contaminated soil). The extent and acceptability of ancillary risk associated with the use of the toxicologically-derived environmental quality standards in remediation is a separate issue for the consideration of the Minister. Under the CSR regime, ancillary risks associated with remedial solutions (e.g. risk management options) is considered under site remediation planning, not in the setting of environmental quality standards.
10	Our company fully supports the comments from the BCELTA committee and would like to continue to see a productive relationship between the BC Ministry of Environment (BC MoE) and the BCELTA committee members.	MoE appreciates support for BCELTA comment and shares the desire for a productive relationship between MoE and BCELTA.

11	<p>Address Samples That Are Not Water or Soil Matrix – A significant portion of contaminated sites samples analyzed relative to the CSR regulations do not fit into the matrix classification of water, soil or sediment. Specifically, high moisture and high TOC and/or high organic component samples are treated as soil. BC has large areas of wetlands and bogs and not having an appropriate classification to generate appropriately contextualized results for those samples has been an issue on high organic sites, as well as, a discrepancy between the Oil and Gas Commission and the BC MoE. We see an opportunity to explore establishing a matrix called either “organic soil” or “tissue” or “organic” that would be supported by toxicity data specific to organisms found in high organic samples. In general, any “soil” that exceeds a moisture content of 40% and is not inorganic in nature is effectively not technically a soil anymore and should be classified differently. Either, as a sediment (if the majority dried constituent is mostly inorganic) or organic (if the majority dried constituent is organic) matrix. The TOC analysis could be used as a test for determining if the sample is “organic” i.e. anything over 30% TOC would be an “organic” and have regulations applied to it based on that characteristic. This matrix would also be an appropriate classification to add to the standards especially for salt but also for metals which already have BCMOE methods identified but no standard to compare to. The standards could be in wet weight versus normalizing to a dry weight basis due to significant magnification of results that occurs when applying a dry weight correction to very wet samples. This change would address a large class of samples that do not fit into the water or soil matrices and show leadership defining a relevant matrix as the BC MoE did with the introduction of the air matrix in Schedule 11.</p>	<p>This issue is the focus of a CAPP funded research project related to possible development of "wetlands standards for salt". The ministry supports and is a participant on the Steering Committee for that research. The outcome of the research will be considered by the ministry in regard to possible future (i.e. next cycle) changes to the CSR standards.</p>
12	<p>Species at Risk Act (SARA): Contaminants in the marine environment have been cited as primary or secondary threats to nine Pacific marine mammal species or populations that are listed under the Species at Risk Act (SARA) in Canada. Specific pollutant threats vary among marine mammal species, reflecting their life history, habitat use, distribution and feeding ecology.</p> <p>In the process of considering changes to the BC CSR Schedule 6 numerical water standards protect aquatic life (AW) (and subsequent inclusion in the new Section W), our agency encourages consideration be given to the bioaccumulative effects of contaminants on apex predators, such as the endangered Southern Resident Killer Whale population.</p> <p>Further, BC CSR sediment criteria, like most other standards from jurisdictions such as Canada-wide and US EPA, are effects-based quality criteria and lacks consideration for impacts of bioaccumulation in the aquatic ecosystem. Bioaccumulation has shown to be a major concern for higher trophic level marine species and specifically for species at risk such as Transient and Resident Killer Whales in the Canadian waters (e.g., Polychlorinated Biphenyls (PCBs) in marine sediment. See DFO. 2010. Impact of at sea disposal on resident killer whale (<i>Orcinus orca</i>) critical habitat: Science in support of risk management. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/046; <a href="http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/saras/2010/2010_046_e.pdf">http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/saras/2010/2010_046_e.pdf</a>). It is understood that the sediment criteria is proposed not to undergo any changes in the current stage 10 update due to resource constraints. Instead, major update effort will be planned for stage 11 in five years' time.</p> <p>Our agency encourages giving consideration to potential bioaccumulation impacts from existing contaminants such as PCBs, as well as other newly emerging contaminants such as polybrominated diphenyl ethers (PBDEs), to higher trophic level aquatic species and SARA listed species while undertaking the sediment criteria update. In this regard, our agency is open to be engaged and collaborate with your</p>	<p>The ministry agrees that the issue of bioaccumulation and biomagnification is an important aspect for the setting of environmental quality standards. However the current "State of the Science" is currently inadequate to develop generally applicable and meaningful standards that specifically incorporate bioaccumulation or biomagnification. Rather, issues related to bioaccumulation and biomagnification are better served through site-specific ERA.</p>
13	<p>In view of the tight timeframe and the hard deadline of August 28th for submission of these comments, our society wishes to again reiterate that it is available at all times to draw on its expertise to assist the Ministry informally on any background science advice which would be of value in selecting revised standards over the next few months. In the meeting on the 26th, our society welcomed the willingness of the Ministry including the authors of particular policy documents to be open to further consultation with members of our society. <u>As a further observation, not meant to be critical, our society notes that in all the policy documents that follow there are places where in depth background information could be greater.</u> Again, in the meeting on August 26th the Ministry provided some valuable explanation on timelines and methodology which provided more detail.</p>	<p>The ministry appreciates the support and offer of assistance for the project.</p>
14	<p>Our society also notes that taken as a whole, the policy documents tend to overlap in their references to the consolidation of existing schedules into the new Schedule X and Schedule W for water. The consolidation offers a measure of convenience for practitioners consulting the standards.</p>	<p>The ministry appreciates the support of the approach proposed in the omnibus update to the CSR.</p>

15	Finally, our society notes and endorses the decision of the Ministry of Environment to adopt many of the recommendations that were provided by the SABCS in the 2009 CSST Soil Standard documents that are referenced in the policy papers. In addition, the 2005 soil standards overview by Golder & Associates in collaboration with SABCS has provided background for the current revisions. Our society also notes the reference to the 2011 report by Golder and Associates on high density urban residential soil standards in which the SABCS partnered in a review capacity.	No Response needed.
16	Our society notes and supports the change to finally eliminate the LEP and HEPH designations and move to adopting the CCME approach. It is slated for the next amendment cycle	The ministry has not made a decision to adopt the CCME approach to PHCs as part of the Stage 10 amendment to the Regulation. Rather the ministry has deferred the issue of updating PHC standards to the next cycle of review.
17	A general comment relating to the timing of amendments. It appears as if the protocol will be finalized before amendments to numerical standards are updated. If this is the case, there may be instances where calculated results are less than background levels or results that are not reasonably achievable. For this reason, flexibility in how the protocol is applied should be considered to ensure values may be adjusted where appropriate to avoid unintended outcomes.	The CSST protocol includes adjustment of the draft standards for background and analytical detection limit.
18	Finally the ministry should consider that its guidance is that BC soil standards are to be applied to maximum values, and then 95% UCLM and 90th percentile concentrations. In contrast, CCME soil quality guidelines (SQG) are compared to the arithmetic means. For this reason, provincial standards should not be set as low as CCME SQGs.	No response needed
19	Request for Advance Input Regarding Reduced Numerical Standards and New Standards. Our committee requests advance input from BC MOE with detailed information about proposed reductions to existing numerical standards, and about proposed new standards for new substances. Upon receipt of this information, which will be held by our members in confidence, our committee will advise MOE about whether published test methods exist for new substances, and	Draft standards will be provided to the BC Environmental Laboratory Technical Advisory Committee (BCELTAC) to ensure analytical methods are available for all CSR prescribed substances and that the draft standards are adjusted for analytical detection limits.
20	Continue with Use of BC Hydrocarbon Parameter Regime within CSR. The BC CSR has operated with the use of BC- defined petroleum hydrocarbon (PHC) parameters and test methods (VPH, LEPH, and HEPH) since 1998. Our committee recommends continued use of these parameter definitions and test methods, as opposed to adoption of the CCME PHC test methods and parameters (F1-F4G). The BC PHC parameters and test methods pre-date the CCME method and parameters by three years, and are in our opinion preferable and better-suited to the management of PHC contaminated sites in BC. The CCME test methods are highly focused on heavy hydrocarbons (C34-C50 and F4G), the analysis of which substantially complicates PHC test methods. Heavy hydrocarbons are not considered contaminants of substantial environmental concern in BC. Continuing with the use of BC-defined PHC parameters allows BC MOE and BCELTAC to retain definition and control of the test methods used for PHC regulation in BC. Although the CCME coordinated the initial creation of the CCME PHC test methods for soils, there is no jurisdiction or body currently in existence that is able to modify or update this method. No CCME PHC test methods exist for PHCs in waters, and CCME has no plans to create such methods. Consider that in 2015, a priority initiative of BCELTAC was to re-define the BC EPH test method for water samples, which will successfully introduce substantial improvements to inter-laboratory consistency for this method. Changes such as this could not be managed effectively if using the CCME PHC test methods. Furthermore, adoption of the CCME PHC test methods and parameters would require a complete overhaul of the PHC management system in BC, since all associated standards and criteria would also change. As an example of problems that this could create in BC, it is important to note that the lowest CCME PHC standards for F3 are frequently exceeded with background measurements from uncontaminated peat soils in Northeast BC.	As stakeholder advice received to date regarding the ministry's current approach to PHCs and the CCME approach to PHCs is both contentious and contradictory, the ministry has decided to defer the issue of updating PHC standards to the next cycle of review.
21	Re-Define PCB to Specify a Broader List of PCB Aroclors. Schedule 5 of the CSR has standards for Polychlorinated Biphenyls (PCBs). PCBs are currently defined in Schedule 5 as including Aroclor mixtures 1242, 1248, 1254, and 1260 (Note: Aroclor is spelled incorrectly in Schedule 5 as "Arochlor"). The four Aroclors currently listed in Schedule 5 are the most prevalent, but in fact there are at least nine different Aroclors that have seen relatively common usage in North America. Our committee recommends that the definition of PCBs be changed to include the sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268.	The offered advice will be considered in developing new PCB standards.

22	It is unclear whether schedule specific lists of new substances have been compiled yet, or whether they will be prior to new standards coming into force. Based on dialogue at the August 13, 2015 meeting, it is our society's understanding that there will be a 6-12 month (yet to be determined) period from the time of release of the new standards (currently targeted for May 2016) until these new standards come into effect. Proponents and site investigators need to be aware of which new substances will need to be considered in site investigations, for example to allow for collection of seasonal data, if required.	Agreed, the ministry will provide a list of new substances (i.e. emerging toxicants of concern) to be prescribed under the Stage 10 amendment well in advance of the "Coming into Force" date.
23	Are lab methods in place for new substances and if not, is there a process to ensure that approved methods are available when the standards are issued, prior to them coming into effect? Are suitable analytical detection limits (dl's) available for new substances to ensure standards are not set below achievable dl's?	Draft standards will be provided to the BC Environmental Laboratory Technical Advisory Committee (BCELTAC) to ensure analytical methods are available for all CSR prescribed substances and that new or updated draft standards are adjusted for analytical detection limits.
24	There is uncertainty regarding whether the toxicity reference values (TRVs) used in the derivation of standards will be made available to CSAP risk assessment Approved Professionals, or more generally to practitioners. Making the TRVs available would increase transparency and consistency.	The ministry is committed to documenting and making publicly available TRV sources used in the derivation of the draft new standards.
25	Adoption of CCME fractions is supported, and it is recommended that this be undertaken in this update rather than waiting until the next iteration. However, if done, it should probably be accompanied by an approach whereby VPH, LEPH and HEPH can be converted into CCME fractions.	As stakeholder advice received to date regarding the ministry's current approach to PHCs and the CCME approach to PHCs is both contentious and contradictory, the ministry has decided to defer the issue of updating PHC standards to the next cycle of review.
26	Adoption of CCME fractions is a great idea; however, if done, it should probably be accompanied by an approach whereby people can convert VPH, LEPH and HEPH into CCME fractions. It is recommended that the adoption of the CCME fractions be undertaken in	
27	With the addition of standards for new substances, there is some concern that DSIs will no longer be able to support risk assessment. It is recommended that some guidance should be provided on how site owners and their consultants will need to address sites. In the documentation regarding Schedule 6 changes, a list of possible new substances is provided. If possible, a list of the new substances for soil and soil vapour should also be provided as soon as possible so that site investigators are aware that data may be needed on the new substances (i.e., does Section 6.1 of Schedule 11 document represent the only substances under consideration?)	The ministry will provide a list of new substances (i.e. emerging toxicants of concern) to be prescribed under the Stage 10 amendment well in advance of the "Coming into Force" date. Guidance will be updated as required, once the new standards have been approved by the minister.
28	For practising members of our society, there is value in maintaining the substance classes in the CSR Schedules, rather than changing the listings to an alphabetic presentation.	Including substance classes in the schedules has created problems in nomenclature, reporting and drafting of legal CSR instruments in the past. The ministry moved to eliminating substance classes, in preference of simple alphabetical listing of substances, beginning with Schedule 11 in the Stage 6 amendment to the Regulation. The ministry sees no reason to, or value in, reversing this process.

CSR Omnibus Update: Overview		
No.	Stakeholder Comment	Land Remediation Response
29	Our organization supports the proposed 5 year review cycle and suggests that our organization be notified very early into the new stages of standard development for each cycle.	The ministry appreciates the support of the approach proposed in the omnibus update to the CSR.
30	Our organization suggests some sort of grandfathering for each five year cycle i.e. how to manage definition changes from cycle to cycle; is a certificate from 5 years ago still valid when the definition changes?	The ministry will incorporate a "Coming into Force" provision (typically 6 months to 1 year) for each cycle of amendment. CoCs issued for RL sites prior to the Coming into Force of the stage 10 amendment will be deemed to have been issued for a RL <sub>LDR</sub> site. A responsible person for a RL <sub>LDR</sub> certified site which would become a <i>de facto</i> RL <sub>HDR</sub> site after the Coming into Force of the Stage 10 amendment may request that the existing CoC be cancelled and re-apply for a new CoC as a RL <sub>HDR</sub> site. Note however, that the <i>de facto</i> RL <sub>HDR</sub> site might have to be re-assessed or otherwise re-evaluated to ensure compliance with the RL <sub>HDR</sub> standards.
31	Where do First Nations fit in?	The ministry is in the process of consulting with First Nations on the Omnibus Update project and the Stage 10 Amendment.
32	Our organization would like a summary about, "what the CSR standard changes mean on the ground for us" for the January/February meetings.	The ministry does not intend to develop sector-specific assessments for the new standards. However, general implications of the new standards will be discussed in sector stakeholder final meetings planned for January 2016.
33	How are you working with labs to ensure new standards can be tested?	Draft standards will be provided to the BC Environmental Laboratory Technical Advisory Committee (BCELTAC) to ensure analytical methods are available for all CSR prescribed substances and that new or updated the draft standards are adjusted for analytical detection limits.
34	Would it make sense to harmonize with CCME standards?	This is largely a policy rather than a standards derivation question. The ministry already harmonizes standards with CCME guidelines where deemed appropriate. However, the ministry also believes that in order to address many standard-related issues specific and unique to the Province (i.e. BC specific aspects) that there remains considerable benefit to maintaining discrete BC derived standards.
35	May you create guidance on the omnibus changes to help people navigate the differences and how to transition?	Due to project time constraints no such guidance is contemplated. The ministry suggests you retain a CSAP for assistance.
36	How will the transition period from when standards are approved to when they are in effect work?	Essentially the proposed "Coming into Force" transition period will delay the implementation date of the new approved standards to a date 6 months to 1 year after the Minister approves the new omnibus standards. During the "Coming into Force" period, only the current (i.e. old) standards would remain in effect.
37	What is the Science Advisory Board for Contaminated Sites Involvement in the CSR Omnibus process?	The Science Advisory Board for Contaminated Sites (SABCS) provided expert scientific review/advice to the ministry on the Omnibus proposals.
38	What will happen with projects that span the 5 year cycle of amendments that is proposed?	It is expected that proponents will appropriately plan for ongoing cycles of standards updating for their multi-year projects. The ministry will be working on next cycle updates throughout the period of the cycle and will engage stakeholders on proposed changes to standards as soon as possible throughout the cycle.
39	Five year update cycle: What will occur if no updates are deemed necessary? When will updates on which, if any, of the currently considered changes will be formally considered for implementation be provided for stakeholder comment?	If during the proposed 5 year cycle no updates are needed, then no updates will be forthcoming. It is planned that the current draft discussion documents will be finalized (incorporating stakeholder comment) as final protocol documents in Nov. 2015. The next and final round of stakeholder consultation (on the draft standards resulting from the final protocol documents) is scheduled for Jan. 2016.
40	Release of updated draft standards on December 18, 2015: Confirm that stakeholders will be provided an opportunity to comment on the updated standards, and the basis for deriving such.	It is planned that the current draft discussion documents will be finalized (incorporating stakeholder comment) as final protocol documents in Nov. 2015. The next and final round of stakeholder consultation (on the draft standards resulting from the final protocol documents) is scheduled for Jan. 2016.

41	<p>Derivation of new toxicological DW (Drinking Water) standards vs. the current aesthetic standards:                  Confirm whether the aesthetic standards will be removed, replaced by toxicological standards, or both.                  If new DW toxicological standards are substantially lower than background concentrations, for e.g., arsenic, confirm if the standards will be real-world adjusted.</p>	<p>Where sufficient toxicological information is available, aesthetic based CSR DW standards will be replaced by toxicological based DW standards. Where toxicological information is lacking, the aesthetic DW standard will be retained. During this cycle, the ministry will only derive new DW standards for finalized new emerging contaminants of concern and current existing aesthetic based DW standards.</p>
42	<p>Parkade Vapor Standards:                  How will this affect DSI (Detailed Site Investigation) delineation assessment?                  Could this result in a push for, for e.g., ambient parkade air sampling during DSI assessment for delineation – irrespective of recognizing that emissions would likely result in concentrations greater than standards (although not caused by any subsurface contamination)?</p>	<p>Indoor air sampling should always be contemplated with caution due to the various sources of interference that may be present in an indoor air breathing zone. The new parkade standard would affect delineation of vapour contamination adjacent to parkades, by providing a more relevant standard when compared to the land use at surface (e.g., RL or CL).</p>
43	<p>Updates to existing vapor standards:                  Confirm acetone standards will be updated based on correctly derived standards</p>	<p>The ministry is aware of recent reassessment of the acetone TRV used to set the existing acetone vapour standard. The ministry intends to update all existing Schedule 11 vapour standards based on current scientifically defensible TRVs.</p>
44	<p>General concerns on more frequent revising of standards:                  -Revising standards on a routine or continuous basis has the potential to be a significant burden to the environmental assessment and remediation industry. Uncertainty is the greatest deterrent for commencing with the process where assessment and remediation is needed.                  - Revisions to standards requires revisiting all prior work to see if there are any new or unforeseen issues Often data from previous reports needs to be re-calculated to compare with most recent standards and this can cause issues to resurface or become a new issue to be addressed before submission of the final report.                  -There appears to be no provision to grandfather the process to create certainty or at least fix the applicable standards for the site/project. Consideration should be given to creating a process where a remediation plan establishes firm cleanup numerical standards for the site at a certain point in time regardless of revisions to the regulatory standards that may occur after remediation has started.                  - The selection of numerical standards in the documents refers to “update and revise numerical standards”. There are numerous references provided which are indicated to be the sources for the updated standards and it is indicated that these sources are scientifically defensible, where the original sources are consider to be less scientifically defensible and “outdated”.                  -We note that information from various sources may not agree on a single applicable numerical standard and there appears to be no discussion as to how to prioritize the most defensible number with most certainty. For example, in the section, “Overview of Some Major Proposed Aspects of the CSR Omnibus Updating of Standards”, Item 7, standards will be based on the calculations in the MOE numerical model. There will likely be other sources that do not suggest the same numerical standard. As such it is not clear what rationale will be used for selection of the most appropriate numerical standard since all may be obtained from scientifically defensible sources, and arguments will claim one is better than another if an overly conservative approach is adopted by the decision makers. Our concern is that such an approach could lead to the most stringent standards being considered would be adopted by the regulator.                  -Further to this, if scientifically derived information is brought to light indicating that numerical standards need not be made less stringent, the uncertainty could result in no change to the numerical standards. An example is the application of the soil vapour standards for petroleum hydrocarbons as documented in the ITRC report in October 2014 which recommends significant relaxation of the soil vapour standards. These changes have not been adopted in Canada. BC should consider a protocol for evaluation of the latest information that is transparent and identifies why a particular numerical standard was selected.</p>	<p>The ministry categorically disagrees that moving to a fixed term of standard updating will increase uncertainty or create a significant burden to the environmental assessment and remediation industry. To the contrary the ministry is proposing to move away from the current <i>ad hoc</i> process for updating standards to a fixed term for standard updating for the express purpose of eliminating uncertainty and providing predictability for all stakeholders (and in particular the environmental assessment and remediation industry) on when changes to the CSR standards will occur.</p> <p>"Fixing" the standards in time is patently incompatible with the primary mandate of the ministry to protect human and environmental health. However, the ministry will recommend to the minister that a 6 month to 1 year "Coming into Force" transition period be provided for the new standards.</p> <p>The ministry recognizes that many sources for scientific data exist. For that reason, the ministry in conjunction with the MoH has developed hierarchies (see TG 7) to decide which sources of scientific data should take precedent.</p>

45	<p>Residential High Density</p> <p>The proposed new Residential High Density (RHD) Land Use would be defined by residential buildings that are 3 stories or greater. We note that the designation of RHD based on building height seems arbitrary. Our organization suggests that the RDH should instead be a density calculation based on the number of residents and exposed surface soil, and we would appreciate further discussion to better understand the rationale behind this definition.</p>	<p>The rationale for the 3 storey building criteria for high density residential land use is provided in the Golder/SABCS report and recommendations for HDR standards. A copy of the report has been provided to the commenter and the ministry plans to post the report to the ministry website as part of the documentation process for the Stage 10 amendment.</p>
46	<p>We realize that the schedule for completing the revisions to the standards is extremely tight and that some changes will be left until a proposed second revision on a fixed timeline in 2020. Our society welcomes a fixed date for the next revision since it assists in assuring that necessary changes are implemented in an orderly fashion. Our society observes that some policy changes could be incorporated into one or more white papers that would allow for a more extended discussion of changes in advance of this 2020 date. Our society realizes that some science and the attendant changes in standards will continually emerge throughout the five year period.</p>	<p>The ministry appreciates the support of the approach proposed in the omnibus update to the CSR.</p>
47	<p>Suggestions Regarding Alphabetical Listings of Substances with CAS Numbers in Merged Schedules. The CSR Omnibus update overview document indicates that CSR schedules will be merged by matrix, with substances listed in alphabetical order with CAS Numbers. Our committee has four suggestions regarding these changes:</p>	<p>No response needed.</p>
48	<p>For selection of substance names for CSR purposes, our committee recommends using the most common name in current usage, as opposed to the exclusive use of formal IUPAC substance names. For example, 4,4'-DDT is far more universally recognized than its IUPAC name of 1,1'-(2,2,2-trichloroethane-1,1-diyl)bis(4-chlorobenzene). Warfarin is far more recognized and meaningful than (RS)-4-Hydroxy-3-(3-oxo-1-phenylbutyl)-2H-chromen-2-one. Provision of CAS numbers will provide easy links to alternative names for complex organic compounds. Our committee offers our assistance in the selection of the most commonly used and most appropriate substance names for CSR purposes, and with providing associated CAS numbers, where they exist.</p>	<p>Issue has been referred to BCELTA for advice and recommendations.</p>
49	<p>If substances will be listed in alphabetical order, our committee recommends that each substance also be listed with a substance class description (e.g. metals, volatile organic compounds, etc.), to assist practitioners with determinations of which substances may be of potential concern at a given site. Our committee offers our assistance with the selection and designation of suitable substance class names for this purpose.</p>	<p>Including substance classes in the schedules has created problems in nomenclature, reporting and drafting of legal CSR instruments in the past. The ministry moved to eliminating substance classes, in preference of simple alphabetical listing of substances, beginning with Schedule 11 in the Stage 6 amendment to the Regulation. The ministry sees no reason to, or value in, reversing this process.</p>
50	<p>Regarding the use of CAS numbers, our committee would like to point out that many regulated substances or test parameters do not and cannot have defined CAS numbers, which must be anticipated within the proposed CSR model. CAS numbers are primarily useful to uniquely identify or differentiate organic substances which can have many different synonyms. They either do not exist or are not useful for unique differentiation of many regulated parameters, for example: total and dissolved metals</p>	<p>Cautionary advice is duly noted.</p>
51	<p>The overview proposes that the ministry amend the Regulation within a fixed period of time, with the suggestion of a fixed five year cycle. We are support of a review cycle that provides predictability and facilitates management of resources to review and implement updated standards. However, we propose that consideration be given to lengthening the timeline beyond five years. In our view, an eight or ten year cycle would be more appropriate. This would for example allow for five year monitoring programs and for developments of best practice to inform new standards and minimize their risk of a rushed process. Additionally, the fixed period amendment cycle should include a mechanism that allows for continued review of submitted site investigation reports and remediation plans that may be impacted by revised standards. Without the crystallization of standards, the finalization of reports and plans will be jeopardized and environmental management goals possible impacted if submitted plans continually require redrafting before implementation can begin.</p>	<p>Based on LRS resources, and the rate of change of the science underlying the standards, the ministry believes a 5 year cycle to be a reasonable period for the development, updating, review and consultation of CSR standards. With the exception of the current commentator, all other stakeholders who have offered an opinion on the time period of the cycle have endorsed the proposed 5 year cycle.</p> <p>In regard to the need for ongoing review of site assessment/site remediation plans and reports during the 5 year cycle, the ministry believes this is a normal aspect of any project which requires a number of years to complete. If assurance is required related to planned multi-year activities on a site, the proponent is encouraged to obtain an AiP for the site.</p>

52	<p>Regarding the consolidation of Schedules 4, 5, and 10, we submit that a staged implementation schedule be considered for new soil quality standards to allow industry to establish best practices for management of same. Additionally we understand new parameters may be added to the new schedule. At this point we are not aware of what these new parameters may be and therefore are unable to begin analyzing for them. To this end, early notification to industry of amendments to the consolidated schedule will be essential.</p>	<p>The ministry now proposes to have a "Coming into Force" provision for the stage 10 amendment. This provision would delay by 6 months to 1 year, the implementation of the new standards once they have been approved. Further a list of the new substances to be prescribed in the Stage 10 amendment (i.e., a list of the emerging contaminants of concern for which new standards will be proposed) will be posted in the late Fall of 2015.</p>
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CSR Omnibus Update: Proposed Amendments to Schedule 4		
No.	Stakeholder Comment	Land Remediation Response
53	BC MOE proposes to develop new mandatory matrix standards where sufficient toxicological data exists. For insufficient data, generic existing Schedule 4 standards will be retained. For those contaminants where soil standards are not being updated, will a wildland and a high density residential land use standard be developed?	Human Health: Schedule X Part 2 (Generic Human Health Soil standards) will incorporate new generic RLHDR and WL standards. The net effect of the different receptor exposure assumptions used to derive RLHDR matrix soil ingestion standards is to produce a RLHDR standard which equals 2x the corresponding RLLDR standard for the substance. Consequently, generic RLHDR Human Health protective soil standards for Schedule 10 substances moved to Schedule X Part 2 will be set to 2x the corresponding current Schedule 10 RL standard. In the case of WL, the net effect of the different receptor exposure assumptions used to derive WL matrix soil ingestion standards is to produce a standard equal to the PL standard. Therefore, the Schedule X generic human health WL standard will be set to equal the corresponding current Schedule 10 PL standard.
54	<p>Has the Ministry considered the availability of data on ED (Endocrine Disruption), NT (Neuro Toxicity) and developmental effects in setting standards in Schedule 4 and other schedules? These effects may exceed acute toxicity in their long term impact on human populations. Increasingly, these effects may be viewed as of higher importance than lethality or short term morbidity. Use of the term toxicity alone tends not to differentiate these. In our discussions the Ministry pointed out that these aspects are normally treated in TRV development and can be the overriding factor. Our society suggested that a checklist or table could be established to identify which of these factors most affects the degree of protection for the values in the new Schedule X.</p> <p>Inclusion of such data directly in Schedule X would introduce undue complication. Instead, a metadata file system could be established for each substance that could include other information supporting selected values. An example would be the CODIS (Continental and Oceanographic Data Information System) that was developed for DFO (T. M. Fyles and P. R. West, 1999).</p>	The Ministry acknowledges the importance of this data in informing the development of environmental standards and these endpoints will be considered where possible (given ministry time and resources). However at this point in time due to time and resource constraints, it seems likely that full consideration of these data will have to await future amendments.
55	Change Benzofluoranthene Substances to Benzo(b+j+k)fluoranthene as per CCME 2010. CSR Schedule 4 currently lists individual standards for Benzo(b)fluoranthene and Benzo(k)fluoranthene. A third benzofluoranthene isomer also exists [Benzo(j)fluoranthene]. All three isomers are almost always present in environmental samples that contain PAHs. Most laboratories do not routinely resolve the three isomer peaks by GC/MS (Gas Chromatograph / Mass Spectrometry). To achieve full resolution of the three isomers requires a slow GC program with a GC column designed solely for this purpose (both of these factors would add substantial and unnecessary costs to PAH test services). Furthermore, small differences between laboratory test method conditions can change the resolution of the three isomers, which can cause lab-to-lab inconsistencies between test results reported for the B or K isomers alone (since the J isomer is usually already included together with one or the other isomer peak). Because of these issues, and because the toxicity and mobility of the three isomers are believed to be similar, CCME recommends in its 2010 PAH guidelines to use the sum of the three isomers for evaluation of benzofluoranthene standards. Our committee recommends to follow this CCME guidance, and to use the sum of the Benzo(b+j+k)fluoranthenes within the CSR. This will simplify laboratory analysis of PAHs while improving interlaboratory consistency. This change is unlikely to have any real impact to the assessment of contaminated sites, because it would be unlikely to exceed benzofluoranthene standards without having also exceeded standards for other PAHs which tend to be found at higher concentrations in environmental samples.	Agreed, the stage 10 amendment will adopt the CCME 2008 approach for benzofluranthenes (i.e. a single standard for benzo (b+j+k) fluoranthene will be established.

CSR Omnibus Update: Proposed Amendments to Schedule 5		
No.	Stakeholder Comment	Land Remediation Response
56	New standards for Arsenic o Criteria would be 10mg/kg; conceivably a significant number of sites would be below background. How would you address this?	Standards are subject to a Provincial Background check. New standard for substance for which Provincial background is known (i.e. arsenic) would be set to equal Provincial background.
57	The proposal document for Schedule 5 indicates that MOE will consider relative absorption factors (where available and scientifically defensible) in the derivation of soil standards. Will this be limited to HHRAs of dermal exposure to soil to be added to the oral dose for comparison with the oral TRV? Please specify. Note that absorption following oral or inhalation exposure should be assumed to be 100%. This is because ingestion and inhalation TRVs are based on ingested/delivered dose or measured airborne concentration, not absorbed dose. For your information, we have included an excerpt below from Health Canada's HHRA guidance <sup>1</sup> regarding relative absorption factors:	The 1995/96 CSST equations already include Relative Absorption Factors (RAF) for dermal, oral and inhalation related soil exposures. Where a recognized and scientifically RAF exists for a substance, it will be included in the calculation of new standards. Further any RAF used will be included in supporting documentation on the derivation of the new standards.
58	Clarify Units for Soil Standards as ug/g (or mg/kg) based on Dry Weight. Virtually all CSR standards for soils are expressed with units of ug/g (parts per million by weight, which is equivalent to mg/kg). The global convention for chemistry parameters in soils is for concentration units to be reported based on soil dry weight. This is done to normalize test results to a common, well-defined concentration unit, for parameters that are associated with or sorbed to soil particles. If test results for soils were not normalized to dry weight units, then concentration based test results would vary dramatically based on the moisture content of a soil (i.e. before or after a rain event). Although this convention has been widely used and recognized in BC for decades, it is not specifically stated in the CSR, and should be clarified.	Agreed, footnote 1 of Schedule X will state "All values µg/g dry weight unless otherwise stated...."
59	Address issues with Schedule 4/5 Standards for Peat Soils / Wetlands. Issues have been raised with the current Schedule 5 Salt Standards (for sodium and chloride), which are believed to be substantially over-conservative in peatlands and wetlands (e.g. in northeast BC). For salts, the adoption of mg/L pore water concentration standards for wetlands has been proposed as a potential solution to this issue. BCELTA is aware that research work is currently underway to provide relevant toxicity data for wetlands ecosystems to support the development of new standards that may address this issue for salts. However, BCELTA would like to highlight that similar issues of over-conservatism (for different reasons than salts) may also exist with the current CSR soil standards for metals and hydrocarbons when applied to peat soils. We recognize that these are complex issues that are unlikely to be fully addressed within the 2016 CSR amendments, but we hope that additional research can continue in the near future so that these issues can be better understood, such that amendments to the CSR can be made where justified.	Agreed, it is hoped that wetlands standards for salt (forthcoming from the CAPP sponsored research) will be available for approval to incorporate into the Stage 10 amendment. However, due to time constraints, the broader issue of wetlands standards for other substances will have to be held over for the next cycle of standards updating.
60	Update and Define Dioxin TEF Calculations in Schedule 5. The current Dioxin TEF calculations in Schedule 5 date are the NATO calculations, which date back to 1989. These should ideally be updated to newer TEF calculations from WHO (2005), which also include coplanar PCBs. Furthermore, the CSR needs to specify how non-detect values are to be treated in the TEF calculations. Three different approaches are currently in use in different jurisdictions, where non-detect values are treated either as zero ("lower-bound"), or as one-half the detection limit ("mid-bound"), or as equal to the detection limit ("upper-bound"). BCELTA recommends use of either the "lower-bound" or "mid-bound" approach, depending on MOE's desired degree of conservatism for this measure.	Agreed, 1. Dioxan/furan TEFs will be updated and used to calculate new soil standards for dioxin (and dioxin-equivalent coplanar PCBs). In regard to analytical detection limits, the ministry has no comprehensive or standardized rule related to how non-detects should be interpreted. Different programs in the ministry typically use either the lower bound or the mid-bound approaches. LRS has traditionally favoured use of the mid-bound approach in interpreting non-detect concentrations for dioxins/furans.
61	The general assumption underlying the existing soil standards regime is that we are protecting the terrestrial environment by protecting soil invertebrates and plants. The EcoSSL values indicate that this may not be so for many substances like antimony, cadmium, copper, lead and zinc for example where avian and mammalian screening levels are lower than they are for SI and P. Consideration should be given to a 'wildlife check' in the update to the derivation protocol.	MOE has flagged the development of wildlife standards for consideration in a future next cycle of soil standard updating. Time constraints preclude the development of wildlife standards in the current update.

62	Define "DDT and DDT Metabolites" in Schedules 5 and 6. Schedules 5 and 6 both contain standards for DDT and DDT Metabolites, but the exact isomers and metabolites to be included for evaluation of the standard are not defined. The CSR should clarify which isomers and metabolites are to be included.	Agreed, isotopes comprising DDT and DDT metabolites will be specified in the new schedules.
63	<p>There are two proposed derivation methods: Method 1 (Quartile binning/regression) when sufficient data are available, and Method 2 (geometric means for low/moderate effects, standards). In both methods data for non-lethal effects and data for lethal effects (up to 65% effect level) is combined. In the past, lethal data only up to LC 20 was included. Wouldn't including lethality data for up to 65% lower the level of protection offered by the newly derived standards? This is more prevalent when Method 2 is used than in Method 1:</p> <p><b>In Method 1</b> a regression for 4 data points is calculated from quartile binning. It can be expected that the regression line, when lethality data (&gt;20%) is included, is shifted towards higher effects concentrations, compared to a regression line that is based on only non-lethal effects and lethality (&lt;20%). Therefore, when the standards for CL/IL are read from the regression line at the predicted 50% effect concentration, AL/RL/PL at 25% and WL at 15% the resulting standards would offer different protection depending on what data was included when the regression line was calculated.</p> <p><b>In Method 2</b> a geometric mean for Low Effects Range (LER) data becomes the AL/RL/PL standard (LER= 15-34% lethal and non-lethal effects), LER divided by 2 becomes the WL standard and the geometric mean of the Moderate Effects Range data (MER=35-65% lethal and non-lethal effects) becomes the new CL/IL standard. Depending on the data available, especially the resulting CL/IL standards could be much higher compared to the original method which selected the greater of EC50 (non-lethal) and LC 20 data as CL/IL standard.</p>	MOE agrees that using a more sophisticated data interpretation process with iterative review and elimination of outliers and successive binning may identify an optimal concentration response relationship. Some of these options were examined in initial aspects of finalizing the preferred approach. It was found that in most cases the net improvement (i.e. refinement) of the resulting standard compared to the quartile bin procedure was typically minor. Further due to the increased resource requirements the simpler binning process was ultimately selected for the protocol.
64	This comment is not intended to judge the adequacy of the provided level of protection; it is just intended to point out that the proposed derivation method will result in less conservative standards compared to the original derivation method as cited in Table A1 (CSST 1996).	No response required.
65	The proposed protocol does not specify which sources for toxicity data would be consulted, or what quality control parameters will be applied to include/exclude data when deriving new standards. Inclusion of new high quality toxicity data is essential in deriving better standards. If new standards were based on the same toxicity data as used to derive the original standards, the only difference would be the modified derivation protocol	For human and ecological health, the hierarchy of sources for TRVs provided in the protocol papers will be used as primary sources. The ministry is committed to using up to date and scientifically defensible TRVs. For the ecological protection standards, MOE proposes to use the previously vetted toxicity data from CCME and the Ontario Ministry of Environment. Additional sources will be sought as time permits to update specific substances. These sources will be reviewed using criteria based on the CCME soil protocol.
66	The proposed derivation methods do not include the derivation method for the new High Density Residential Standards (RL <sub>HDR</sub> ), but do include the derivation method for new Wild land (WL) standards. The document explains earlier (pg. 3) that RL <sub>HDR</sub> are to be ½ of the corresponding CL standard. This is in contrast to Table A1, where the level of protection for both high density and low density residential is shown to be the same.	After further review and consideration of the original Golder/SAB 2011 review, the 2015 Golder Summary HDR paper and in consideration of comment received related to the proposed Human Health Exposure Terms and Soil Ingestion Rates for the various land uses, the ministry has decided to derive the new Human Health RL <sub>HDR</sub> standard on an ET = 1.0 and SIR of 10 mg/day for adults and 40 mg/d for children.
67	Our agency supports decision to adjust <b>soil</b> standards to BC's ILCR of 1 in 100,000 instead of USEPA's ILCR of 1 in 1,000,000 (as indicated in the Schedule 10 proposal document). Our understanding is that an ILCR of 1 in 100,000 was already applied in CSR standards. Is that not correct? Also, can we assume that the ILCR of 1 in 100,000 will be applied to the CSR <b>drinking water and vapour</b> standards as well as the soil standards?	The CSR ILCR risk based standard of 1E-05 will continue to be used to set new human health standards for carcinogenic substances for all environmental media.
68	Will the proposed modified exposure duration terms outlined in the proposal document for Schedule 5 (p.3) be applied to all CSR standards (soil, water, vapour)?	No, ETs are specific to only soil standards.
69	The proposal document for Schedule 5 cites Health Canada's PQRA Guidelines dated 2012. Our agency is not aware of revisions to these guidelines since 2010. Is 2012 a typo or has MOE secured a more updated version of the guidelines?	Health Canada's PQRA Part 1 was revised in 2012.

<p>70</p>	<p>Page 4 Wildlands definition –</p> <p>In the definition of Wildlands proposed in Schedule 5, does the definition of Wildlands include campground areas within national or provincial parks or will the campground areas be considered urban parkland, consistent with CCME (2006)? (CCME (2006) in their definition of residential/parkland states that the residential/parkland land defines parkland as ‘a buffer between areas of residency, and also includes campground areas, but excludes Wildlands such as national or provincial parks’). Does BC MOE’s definition of Wildlands encompass other areas of parks such as maintenance garages, interpretation centres, gift store, etc.,) that may be used for other purposes that do not support natural ecosystems or are these classified according to their land uses even though they are within park boundaries? Some additional text to clarify how the Wildlands land use in those portions of land that have other uses within a wildland reserve would be helpful.</p>	<p>The determination of wildlands land use is dependent on the extent of human management / maintenance of the land. From CSR (1):</p> <p>Wildlands land use [WL] “means the use of land for the primary purpose of supporting natural ecosystems including, the use of land for ecological reserves, national or provincial parks, protected wetlands or woodlands, native forests, tundra and alpine meadows, but does not include uses defined as urban park land use”</p> <p>Urban park land use [PL], “means the use of urban land for the primary purpose of outdoor recreation including, without limitation, municipal parks, fairgrounds, sports fields, rifle ranges, captive wildlife parks, biking and hiking areas, community beaches and picnic areas, but does not mean wildlands such as ecological reserves, national or provincial parks, protected wetlands or woodlands, native forests, tundra and alpine meadows.” [Source – Section 1, Contaminated Sites Regulation].”</p> <p>For larger land parcels, such as Provincial Parks, portions of the land can have multiple land uses, including retail and maintenance areas. These areas are not 'unmanaged land' and the mechanism by which managed areas within a larger wildlands area can be considered under a different land use category will be clarified in future guidance.</p>
<p>71</p>	<p>Page 4, Table 2.</p> <p>The defined land use scenario and indirect soil exposure pathways include groundwater as a drinking water source. Please identify whether surface water should also be identified as a drinking water exposure pathway. Also, ingestion of country foods is not included in the land use scenario for Wildlands, yet the defined land use scenario is ‘a seasonal wildlands camp with a family living on-site’. It appears that the food ingestion pathway for country foods or food harvested from Wildlands is also missing as an exposure pathway.</p>	<p>The reference to groundwater as drinking water in the defined exposure scenario is needed to tie in the matrix "soil to groundwater used as drinking water" Schedule X soil standard. Surface water used as drinking water is evaluated directly by reference to the Schedule W DW standards. In regard to country food ingestion on WL, the standard is specific to incidental soil ingestion. The CSST protocol addresses other sources of contaminant exposure (e.g. to food, air, water and consumer products) in addition to soil ingestion, through the use of the SAF (soil allocation factor) which effectively apportions the TRV for a substance equally among the five exposure sources (i.e. 20% of TRV for each of: soil, water, air, food and consumer products).</p>
<p>72</p>	<p>Page 4 Residential HDR definition –</p> <p>It would be useful to include Commercial land use in Table 3 so the distinction between Residential HDR and Commercial land use is emphasized, since Residential HDR can be confused with Commercial land use, especially since some of the land uses in the proposed Residential HDR (such as daycares) may be considered commercial land use in the federal context and this is likely to cause some confusion. Some explanatory text that explains why commercial hotels or motels are not included in the Residential HDR definition and how hotels with residential units are classified would be helpful. Additional text on the differences between the different land uses and an explanation of how mixed-use sites (such as commercial sites with residential units above, and hotels with residential units) are classified would also be beneficial. We note that lower ingestion rate for soils at Residential HDR sites (10 mg/d for adults and 40 mg/d for children at Residential HDR sites compared to 20 mg/d for adults and 80 mg/d for children at Residential LDR sites) are proposed. It would be beneficial to include the rationale and/or derivation of the ingestion rates for high density residential in the documentation</p>	<p>The ministry will provide the requested information in documentation on the derivation of HDR and LDR standards, once the protocol and the new standards have been approved under the Stage 10 amendment.</p>
<p>73</p>	<p>Page 5 Soil Bioavailability Factor –</p> <p>Does this refer to default values from environmental regulatory agencies? With respect to human health relative bioavailability (RBA) adjustment factors, Health Canada’s current recommendation is to determine whether RBA adjustments at a site should be considered and if it is determined that a RBA adjustment is feasible and worthwhile, site-specific testing and derivation of site-specific value(s) are preferred over the use of a default value. Regression or correlation equations have been developed for Pb and As (although regression equations for As has not yet been accepted on a national basis by North American regulatory agencies). If a default RBA is used for a site, scientific rationale and justification should be provided to support the use of the default RBA value at the site.</p>	<p>The intent is to allow use (most likely as a next cycle of standards updating issue) of the bioavailability adjustment factors (for gut, skin and lung absorption) which are already enabled under the 1996 CSST equations where there is sufficient international agency support for such bioavailability adjustment factors for a substance. As indicated in the bioavailability review referenced in Appendix C of the Schedule 5 HHPS proposal paper, with the possible exception of European Union bioavailability factors for zinc and lead, no such international factors currently exist.</p>

74	<p>Page 15, Table B1.</p> <p>Please note that HC (2012) does not specify default exposure frequency and duration for the Urban Parkland or Wildlands scenario. Due to the wide variation of exposure scenarios for Wildlands land use, Health Canada recommends that exposure frequencies and durations for Wildlands should be developed on a site-specific basis and any dose-averaging should be applied on a chemical specific basis for carcinogens and non-carcinogens with the appropriate scientific rationale provided. Note that Urban parkland and Residential land use exposure frequency and duration are often considered together for setting CCME human health-based soil quality guidelines (SQGs) using CCME (2006). Health Canada has interim guidance on dose averaging for short-term exposure to carcinogens and we are currently working on short term exposure to non-carcinogens (see additional information below)</p>	Duly noted.
75	<p>Appendix C.</p> <p>Incorporation of bioavailability (RBA) in soil standards – Do standards include guidelines (such as the CCME SQGs) in the discussion in Appendix C? Standards generally have legal ramifications and are included in legal instruments whereas guidelines are not legal or regulatory values unless they are written into legal instruments. If this discussion includes guidelines, note that bioavailability adjustment factors (RAFs and RBA) can be incorporated in human health soil quality guideline derivation. For example, the CCME human health SQG equations include relative bioavailability factors for oral ingestion and dermal absorption. Typically a default of 1 is used for oral RBA, but absorption factors for both oral ingestion and dermal absorption can be incorporated into the Human Health SQG.</p>	Both the 1996 CSST and CCME SQG soil standard/guideline equations enable use of bioavailability adjustment factors. However as detailed in Appendix C internationally recognized bioavailability factors do not currently exist for the vast majority of substances. Consequently, both the ministry's and CCME's human health soil ingestion standards/guideline set bioavailability to 1.0 (i.e. 100%) as a default assumption. Again, the broader issue of bioavailability adjustment for the purpose of setting CSR soil ingestion standards will be re-assessed as a component of the next cycle of standards updating.
<b>Environmental Protection Standards</b>		
76	<p>Page 2, point 7.</p> <p>We suggest that the term bioavailability be clarified as relative bioavailability when speaking of soils. (There often is confusion related to absolute and relative bioavailability and bioaccessibility).</p>	Agreed, suggestion was adopted
77	<p>Page 3, Table 1.</p> <p>It would be helpful if the rationale for the 26 weeks exposure duration for the Wildlands scenario was provided.</p>	Agreed, rationale was added
78	<p>The Drafts state that new soil standards will be derived for wildlands, specifically for plant and soil. A 15% effects concentration (EC15) level of ecological protection is proposed in the CSR Omnibus updating: proposed amendments to Schedule 5 Environmental Protection Standards. We are concerned that 15% effects concentrations are very challenging to reliably derive from laboratory toxicity testing data and furthermore that effects associated with these concentrations would not likely be detectable in the real world environment. For this reason we recommend a reconsideration of this approach.</p>	MOE proposes 15% as a reasonable protection goal for wildlands. The consensus within MOE is that unmanaged lands should receive the highest level of protection of the various CSR land uses.
79	<p>Good to see that such will be based on scientific data, however are conservative when using EC15 levels.</p>	
80	<p>Has the bioavailability of contaminants been considered?</p>	Bioavailability has not been directly considered in the development of soil standards for environmental protection. This issue has been flagged as an item to consider in the subsequent standard update.
81	<p>Why will the livestock ingestion level utilize the CSST 1996 approach, rather than a new approach?</p>	Time constraints prevent development of a new livestock standards approach.
82	<p>The proposed categories for standards seem to be based on criteria that are different than the historical categories of zoning. Consequently the application of the standards could be based on someone (third party) interpretation and possibly</p>	Each of the land uses categories have specific definitions which can be found in the MOE document: "Procedure 8: Definitions and Acronyms for Contaminated Sites". If the land use at a site is unclear, MOE can be contacted for specific guidance.

	arbitrary.	
83	Does wildland apply to crown land only, and what about areas where forestry will occur or has occurred? Urban parks can be thought of as places with landscaping and manicured lawns and children’s playgrounds, but what about untended forest not located within or near an urban populated area? For example, is Stanley Park a wildland or urban park?	<p>The determination of wildlands land use is dependent on the extent of human management / maintenance of the land. From CSR (1):</p> <p>Wildlands land use [WL] “means the use of land for the primary purpose of supporting natural ecosystems including, the use of land for ecological reserves, national or provincial parks, protected wetlands or woodlands, native forests, tundra and alpine meadows, but does not include uses defined as urban park land use”</p> <p>Urban park land use [PL], “means the use of urban land for the primary purpose of outdoor recreation including, without limitation, municipal parks, fairgrounds, sports fields, rifle ranges, captive wildlife parks, biking and hiking areas, community beaches and picnic areas, but does not mean wildlands such as ecological reserves, national or provincial parks, protected wetlands or woodlands, native forests, tundra and alpine meadows.” [Source – Section 1, Contaminated Sites Regulation].”</p> <p>Wildlands does not pertain solely to crown lands. As the primary use of Stanley Park is as a municipal park, the applicable land use is Urban Parkland, not Wildlands.</p>
84	Why will wildlands be one half of the urban park levels (using method 2), when it is anticipated that wildlife lands would have less contact with people than urban park land (i.e. less risk)?	The derivation of wildlands as a fraction of the urban park value is specific to ecological receptors (soil invertebrates and plants) and not humans.
85	Wildlands Why will wildlands be one half of the urban park levels (using method 2), when it is anticipated that wildlife lands would have less contact with people than urban park land (i.e. less risk)? While acknowledging that such considers keeping wildlands pristine, has the resiliency of the habitat and anticipated low footprint of sources (e.g. well heads) been considered?	The derivation of wildlands as one half the urban park value is specific to wildlife receptors and not humans. The wildlife standards are effects based standards, not pristine or no-effect guidelines. The areal extent of the contamination is not part of the standards development as these considerations are factored into the site investigation and characterization.
86	While acknowledging that such considers keeping wildlands pristine, has the resiliency of the habitat and anticipated low footprints of sources (e.g. well heads) been considered?	The wildlife standards are effects based standards, not pristine or no-effect guidelines. The areal extent of the contamination is not part of the standards development as these considerations are factored into the site investigation and characterization.
87	Developing soil standards protective of terrestrial vertebrates (Pg. 9): o Will this move towards developing standards protective of, for e.g., rats, etc.?	The CCME and some other agencies which develop environmental quality guidelines have derived soil standards for terrestrial vertebrates, specifically birds and mammals. Amphibians and reptiles are also sometimes included if sufficient data is found to derive soil standards for these groups. The Ministry’s proposed derivation approach considers the standards in relation to valued receptors at a site, and nuisance species would not usually be consider as critical receptors.
88	Wildlife Soil and Food Ingestion (Pg. 9, Bullet 2) “Review of wildlife soil and food ingestion data for application to wildlands and agricultural lands”.  Are we planning to apply data from wildlife species to species commonly found in agricultural lands (i.e., apply WL criteria over to AL criteria)? Data for livestock are presumably already incorporated in existing livestock criteria. It may be able to apply already available livestock data to species living in wildlands without further rework.	The intent to gather wildlife soil and food ingestion data is to develop up-to-date estimates of these parameters so that accurate wildlife exposure estimates can be derived for future standard updates. Relevant information on exposure to domestic animals can be incorporated into the exposure assessment; however there are also differences between wildlife and domestic animal exposure which would be considered.
89	It is not clear why the environmental protection limits of the High Density Residential Land Use (RL <sub>HDR</sub> ) are set to ½ of the Commercial Land Use (CL) limits and why there is a different limit for RL <sub>LDR</sub> .	The original recommendation from the 2011 SAB document was to have the CSR CL standard apply for the ecological receptors (Toxicity to soil invertebrates and plants) for High Density Residential land use. The ministry will clarify that the EH soil invertebrate and plant standard for RL <sub>HDR</sub> will be set to equal the CL standard.
90	For high density residential (HDUR) sites, rather than using a 0.5 factor (50%) applied to the CL standard, consider selecting either the AL/PL/RL value or the CL/IL standard as the HDUR standard based on a policy decision regarding the desired level of protection. There appears to be more similarity in the desired level of protection between CL and HDUR than between RL	

	and HDUR. Alternatively, consider using an EC 37.5 if the data are sufficient.	
91	Since the British Columbia Science Advisory Board (SABCS) has recommended the geometric mean method, why is the Ministry of Environment (MOE) proposing to use a different linear regression method from the Contaminated Sites Soil Task Group (CSST) protocol (1996)?	<p>The SABCS review or the CSST protocol provided much useful information, however their recommended new protocol was found to be difficult to put into practice, as described on page 6 of the soil protocol proposal paper: "The ministry subjected the SABCS, 2009 [4, 5] above methodology to review and trial for a limited number of substances. Based on this experience with the method, the ministry noted the following concerns.</p> <p>The method:</p> <ul style="list-style-type: none"> <li>a. is very labour intensive and is somewhat complicated in practise,</li> <li>b. is often unworkable for the typically limited toxicity datasets available for most substances</li> <li>c. discards both low effects data (&lt; 35% effect) and high effects data (&gt; 65% effect)</li> <li>d. does not consider the slope of the dose:response curve for the substance</li> <li>e. typically produces more stringent soil to invertebrate standards when compared to the CSST, 1991 [1] regression based method.</li> </ul> <p>In light of the above concerns the ministry does not propose to use the SABCS, 2009 [4, 5] recommended geometric mean based method to derive updated soil invertebrate and plants matrix standards. Rather, the ministry has developed a simplified new proposed SABCS, 2009 [4, 5] geometric mean based method for use only when the ministry's preferred proposed new modified CSST, 1996 [1] regression based method cannot be used."</p>
92	Appendix A, Table A1:  Explanation of the rationale for selection of the protection factors of 1.5 and 2 in the recommended method for Wildlands would be beneficial.	The SABCS recommended wildlands derivation procedure can sometimes result in values equivalent or less than background concentrations. MOE decided to propose an alternative method using a simple divisor which would approximate the step down from the residential land use protection level of 25% to the wildlands 15% protection level. As a starting point the draft protocol used 2.0 as the step down factor, however once regressions have been run using Method 1 of the protocol, we will examine the ratio of the RL/WL values and use this information to derive a step down factor which will more closely approximate the desired 15% protection level for wildlands.
93	Appendix E, Table E1 and E2:  Several metals are scheduled to be updated in this round of amendments to the CSR standards, nine of which are included in the Organic Matter Recycling Regulation (OMRR). Will the OMRR be amended consequentially to reflect the changes in standards for these metals?	The Organic Matter Recycling Regulation (OMRR) is a separate regulation and contains schedules based on the Contaminated Sites Regulation. The current intent is to include a Consequential Amendment to OMRR to update OMRR using updated CSR standards.
94	It is suggested that some flexibility be provided to the application of linear regression model in the proposed derivation method 1, as there is always a possibility that models other than linear regression may fit the data better (although this is also mitigated by the existing R-square rule in method 1).	In some cases for some substances, using a non-linear regression may improve the data fit, however with sparse data sets having high variability the data can be over-fitted and lead to outliers having excessive influence on the standard. The proposed high R-squared requirement is to ensure the concentration - response relationship is in a linear range. Failure of the linear fit requirement would result in use of the proposed geometric mean approach which is independent of curve fitting.
95	Our society is comfortable with the regression approach for identifying toxicity standards for soil invertebrates and plants. We are less comfortable with the combining of NL and L data when deriving these standards. We have assumed that combining NL and L data was recommended because of the lack of data available for many chemicals. We suggest combining NL and L data only be employed when there is insufficient data available to base standards on separate NL and L Regressions. Furthermore, in cases when NL and L data are combined we recommend that no L data between L50 and L100 be incorporated.	The draft protocol recognised the potential for data bias and included data quality assurance/quality control screening for, "excessive lethality data influence". The intent is to use lethality data, but limit the influence so that it is similar to the CSST LC20 limit. Corrections for data bias could include use of uncertainty factors or other methods.

96	In creating Schedule X will values for contaminants for new land classes (RL <sub>HDR</sub> and WL) be derived? Will this also be the case for substances transferred from Schedule 4 to Schedule X? In creating Schedule W will data from Schedule 10 be used? Our society understands through discussions with MoE that every effort will be made to fully complete the data in Schedule X, parts A, B, and C, but that values where further data or clarification of the background science is required may be temporarily labeled as N/A.	The intent for soil environmental protection schedule X is to derive wildland standards and high density residential standards for as many as possible of the current Schedule 4 and 5 substances. For schedule 4 substances moved to Schedule X Part 3, for which new WL EH standards cannot be derived, wildlands standards will be set to equal their corresponding Commercial standard as recommended in the 2011 Golder/SABC Report on High Density Residential Standards.
97	Recalculation of existing matrix standards should not be conducted unless the data set has been significantly expanded, reflects the current literature as much as possible, and it can be shown that the new method improves the representation of the underlying data. This would have the additional benefit of allowing the limited Ministry resources to focus on substances that have more modern literature compilations that do not yet have matrix standards.	In order to maintain consistency in the derivation of wildland standards MOE has decided to derive as many as possible of the soil standards using the new protocol.
98	Consider inclusion of a 'wildlife check' in the update to the derivation protocol as soil invertebrate and plant standards may not be protective of wildlife.	MOE has flagged the development of wildlife standards as a priority item for a future cycle of soil standard updating. Time precludes the development of wildlife standards in the current update.
99	<p>A general concern is that recalculation is being proposed:</p> <ul style="list-style-type: none"> <li>a) Without investing enough effort to expand the database being used, and</li> <li>b) Using a derivation method that may not accurately represent the underlying concentration response relationship.</li> </ul> <p>We appreciate the reality that there are both time and resource constraints. However, we are concerned that the "reliability" of a revised matrix standard will not be any greater than the current matrix standard. We recommend that the Ministry review which specific substances that have an existing soil invertebrate / plant matrix standard are likely to have significant new data available given the constraints placed on the literature review, and consider modification of the protocols to emphasize representation of the underlying concentration response data set. We note that the current table E1 lists substances with a CCME derivation of 1996 or later but the majority of substances were derived in 1997 (As, Cr, PCP) or 1999 (Cd, Cu, DDT, ethylene glycol, lead, mercury, PCB and zinc). Nearly all of the data listed in those documents would have been available for the original CSST derivation, and therefore, recalculation would appear to lack significant additional data. Recalculation of existing matrix standards should not be conducted unless the data set has been significantly expanded, reflects the current literature as much as possible, and it can be shown that the new method improves the representation of the underlying data. This would have the additional benefit of allowing the limited Ministry resources to focus on substances that have more modern literature compilations that do not yet have matrix standards.</p>	In order to maintain consistency in the derivation of wildland standards MOE has decided to derive as many of the soil standards as possible using the new protocol. If insufficient new information is available to derive a new EH soil invertebrate and plant standard, then EH soil invertebrate and plant standard for RL <sub>HDR</sub> will be set to equal the existing Schedule 4 CL EH standard.
100	We request that the Ministry commit to providing the underlying data sets being used to derive matrix standards in a format that can be readily accessed, relied upon by risk assessment specialists, and illustrates the decision-making inherent in the derivation method.	The ministry will provide the methods and data used to derive the new or updated standards as a component of the documentation provided for the approved Stage 10 standards.
101	<p>The new proposed protocol recommends combining the lethal and non-lethal distributions into a single data set. This is a significant change from the CSST 1996 protocol, and was not recommended by SABCS (2009) or its predecessor SABCS (2005). a. As an example, according to Step 4 of the new protocol, the 3rd quartile would include both LC50 and EC50 data. This quartile would be collapsed to a geometric mean for the purposes of establishing the regression line. Please clarify whether the quartiles are based on the concentration or the effect axis of the distribution.</p> <p>b. If it is based on the concentration axis, then a given quartile would include a variety of different effects size (e.g., the second quartile could include EC25 data and LC10 data; the fourth quartile could consist entirely of LC75 data). The current language implies that it is based on the effect axis which would not be consistent with the basic underlying toxicological dose-response relationship. Combining LC50 and EC50 data into a single geometric mean is not appropriate.</p>	The quartiles are based on the effect data. MOE agrees that it is not ideal to combine lethal and non-lethal data; however this approach is used by CCME and other jurisdictions. The draft protocol recognised the potential for data bias and included data quality assurance/quality control screening for, "excessive lethality data influence". The intent is to use lethality data, but limit the influence so that it is similar to the CSST LC20 limit. Corrections for data bias could include use of uncertainty factors or other methods.

102	<p>The proposed Method 1 focuses on establishing a regression line based on 4 or 5 data points derived from geometric means of binned data. It seems highly probable that there will be a high r<sup>2</sup> using this approach. It may be more appropriate to attempt to fit a regression line to the entire data set first, followed by an iterative process of reviewing and eliminating outliers. A data-wide regression line (even with a lower r<sup>2</sup>) provides a more realistic and transparent representation of the underlying concentration response. If binning becomes necessary, it may be more representative to divide the data set into 10 bins, and look for a regression equation that provides the best fit to that data set (instead of forcing a linear regression line). A regression based on four or five data points should be the final option, not the first. We reiterate the importance of showing how numerical standards reflect the underlying concentration-response relationship given that the various land uses are explicitly intended to reflect varying levels of protection.</p>	<p>MOE agrees that using a more sophisticated data interpretation process with iterative review and elimination of outliers and successive binning may identify an optimal concentration response relationship. Some of these options were examined in initial aspects of finalizing the preferred approach. It was found that in most cases the net improvement (i.e. refinement) of the resulting standard compared to the quartile bin procedure was typically minor. Further due to the increased resource requirements the simpler binning process was ultimately selected for the protocol.</p>
103	<p>There is a footnote stating that the data will be reviewed for “excessive lethality data influence or dominance by one species”, but no specific targets or mechanisms to reduce that influence if the scenario exists were described. The statement about “uncertainty factors” being used to compensate for biased data needs to be expanded and clarified. Application of default or arbitrary uncertainty factors, acute-to-chronic ratios or other mechanisms should not be done with a clear technical basis.</p>	<p>It is difficult to propose definitive rules for selecting uncertainty factors which might be used as criteria for all substances since there are multiple interacting uncertainties with each dataset. However, generally uncertainty factors which might be used would be based on the perceived undue influence of the study on the final standard and include: proportion of lethality data; effect level; sensitivity of the species relative to others; diversity of species represented in the substance dataset; bioavailability of the test exposure system.</p>
104	<p>The proposed Method 1 is silent on how to use LOEC or MATC data without an associated percent effect. We appreciate the challenge associated with the lack of ECx data being readily available in the compilations, but we reject the historical practice of using NOECs, LOECs, MATCs for derivation purposes simply to avoid the extra resources needed to retrieve the original paper and extract the underlying ECx (or at least, confirming the correct “bin” for the ECx) information. This issue has been repeatedly identified in the literature as a significant error. The Ministry’s new protocol correctly emphasizes the value of establishing the underlying concentration-response relationship so that environmental standards can reflect variable levels of protection based on the regression analysis of the underlying distribution. This approach is being undermined when NOEC or LOEC data are included because of the uncertainty it creates in the distribution along the effects axis. This is particularly problematic when the regression is being used to derive lower ECx values for the WL land use.</p>	<p>MOE agrees it is difficult or impossible to assign specific effect levels with LOEC and NOEC values as they can be greatly influenced by test design. We have decided to include NOEC values in the first bin (which represents the first 20% or 25% of effects data depending on whether it is a 4 or 5 division bin respectively). There is general agreement in the literature that the great majority of NOEL values fall below the 25% effect size. By assigning NOEC/LOEC estimates to the first bin as proposed, this data can be appropriately used in the derivation of the standards.</p>
105	<p>There is limited value in setting the WL standard to the LER / 2 if Method 2 is required. Dividing the geometric mean of the EC15 – EC34 range by two results in an unknown level of protection. As a guiding principle, the various land uses ought to have varying levels of protection, but should not arbitrarily extract a value if the underlying data set does not provide sufficient precision to distinguish a genuine difference. In this context, it appears unlikely that Method 2 can distinguish a meaningful third level of protection (i.e., for WL)</p>	<p>Method two is used when there is insufficient toxicity data to establish an acceptable regression relationship and under this circumstance there would likely be insufficient toxicity data to establish a wildlands standard with a given level of protection. The Low Effect Range (LER) is based on a range of data around 25% effect. Much less data is available around the 15% effect range and few wildlands standards could be set using existing data only in this range. However, the LER standard is in an effect range pertinent to some species and by using a policy established divisor a more protective standard for wildlands may be reliably derived. The SABCs recommended wildlands derivation procedure can sometimes result in values at a background concentration. MOE decided to propose an alternative method using a simple divisor which would approximate the step down from the residential land use protection level of 25% to the wildlands 15% protection level. As a starting point the draft protocol used 2.0 as the step down factor, however once regressions have been run using Method 1 of the protocol, we will examine the ratio of the RL/WL values and use this information to derive a step down factor which will more closely approximate the desired 15% protection level for wildlands.</p>
106	<p>Next Cycle Revisions          Developing soil standards protective of terrestrial vertebrates (Pg. 9):          Will this move towards developing standards protective of, for e.g., rats, etc.?</p>	<p>The CCME and some other agencies which develop environmental quality guidelines have derived soil standards for terrestrial vertebrates, specifically birds and mammals. Amphibians and reptiles are also sometimes included if sufficient data is found to derive soil standards for these groups. The Ministry’s proposed derivation approach considers the standards in relation to valued receptors at a site, and nuisance species would not usually be considered as critical receptors.</p>

107	<p>Wildlife Soil and Food Ingestion (Pg. 9, Bullet 2)          "Review of wildlife soil and food ingestion data for application to wildlands and agricultural lands". Are we planning to apply data from wildlife species to species commonly found in agricultural lands (i.e., apply WL criteria over to AL criteria)? Data for livestock are presumably already incorporated in existing livestock criteria. It may be able to apply already available livestock data to species living in wildlands without further rework.</p>	<p>The WL standards will not apply to agricultural land as this is not an unmanaged land area. The intent to gather wildlife soil and food ingestion data is to develop up-to-date estimates of these parameters so that accurate wildlife standards can be derived for BC wildlife living in unmanaged areas</p>
108	<p>There is generally a lack of deep rooting plants in the wildlands, hence the Toxicity to Soil Invertebrates and Plants matrix factor can often be excluded at depths greater than 1 m. Therefore I wonder if the EC15 is too conservative for the wildland standards, and perhaps an EC20 might even be considered.</p>	<p>MOE is considering a two tier level of protection for WL ecological health protection standards (i.e. an EC15 based standard for use at natural (i.e. pristine) WL sites and an EC25 based standard for use at reverted (i.e. WL reverting from Sch 2 use) WL sites. The ministry believes an EC15 level of protection is a reasonable protection goal for (pristine, unmanaged) wildlands which have never had a Sch 2 use. The consensus within MOE is that natural/native unmanaged WL should receive the highest level of protection of the CSR land uses. CSAP produced soil depth technical guidance in 2013 in which they reviewed the presence of soil and plants at depths greater than one metre. The study identified many typical wildland plants in BC which have roots deeper than one metre.</p>
<b>Human Health Protection Standards</b>		
109	<p>Exposure Terms:          This area continues to utilize overly conservative approach in estimating the Exposure Duration Term (ET). In particular:          The agriculture land assumes 24 hr/day, 7days/wk, 52 weeks/yr and 80 years is meant to represent a farmer living on his land with constant contact with soil at all times (in field, on clothes, in house, etc.)          The wildlands assumes a person in a cabin for 24 hrs/day, 7 days/wk for ½ a year for 80 yrs, and is not meant to be someone hiking through wildlands or camping for 1-2 weeks a year. Most cabins would be seasonal.          Considering the scenario for wildlands noted in page 4, Table 2, what is the basis for assuming the possibility that humans may live for a total of 26 out of 52 weeks in wildlands? (Notes that site specific values needs to be considered for subsistence users.)          The urban parks assume 12 hr days in the park, 7 days a week, 52 weeks for 80 years.....          Would like to see a more flexible and realistic calculation of exposure duration.</p>	<p>The numerical standards must be conservative by design since when sites are remediated to the numerical standards decisions regarding acceptability for human and ecological health at the site are made on the sole basis of the concentration of a substance in the soil at the site (i.e. site-specific information is lacking for the site). The majority of the ETs proposed to be used are based on either the original 1995 CSST ETs or other agencies (Health Canada) exposure term assumptions. The ministry has however, that it would be reasonable and scientifically defensible to slightly reduce the ET assumed for urban parkland to ET = <math>12hr/24hr*7d/7d*48wk/52wks*80yr/80yr</math> from the 1995 CSST urban parkland ET = <math>12hr/24hr*7d/7d*52wk/52wks*80yr/80yr</math>. The ministry also notes that if it is desired to consider site-specific exposure information in determining the acceptability of human and ecological health impacts at a particular site, then the risk assessment/risk management approach available under the CSR, rather than the numerical standards approach should be used for that particular site.</p> <p>The ministry plans to consider ETs more broadly for all land uses as a component of the next cycle of standards updating.</p>
110	<p>Wildlands Land Use - Definition:          Should National Parks be considered if such are under federal jurisdiction?</p>	<p>The reference to "national and provincial parks" in the WL definition is provided as an example of a type of land which would constitute wildlands. The level of government which has jurisdiction over the wildlands is irrelevant to the definition of the particular land use.</p>
111	<p>High Density Residential Land Use:          Good proposed addition to the CSR.          Change definition with respect to schools from "residential schools" to "boarding schools" to keep consistent with Proposed High Density Residential Standards.</p>	<p>Agreed.</p>

112	<p>The following human health defined exposure scenario is proposed for Wildlands land use: Use of land for the primary purpose of supporting natural ecosystems, including the use of land for ecological reserves, national or provincial parks, protected wetlands or woodlands, native forests, tundra and alpine meadows, but does not include uses defined as urban parkland use. The Proposed Exposure Duration Terms (ETs) for the CCST model to derive the WL standards is <math>ET = (24hr/24hr \times 7d/7d \times 26wk/52wk \times 80yr/80yr)</math>. This is based on the Defined Land Use Scenario of: a seasonal wildlands camp with a family living on-site - children are present - groundwater may be used for drinking water. It is proposed to set purpose-derived WL soil invertebrate and plant standards, representing a 15% Effects Concentration (EC15) level of ecological protection, while for AL/RL/PL: standard is predicted EC25 concentration and for CL/IL: standard is predicted EC50 concentration. The definition for ET scenario above conflicts with the definitions in the CSR for residential land use – RL standards apply to temporary or seasonal basis including cabins. As such, a seasonal wildland camp would be considered located on Residential Lands and RL standards would apply, not Wildlands. Given this, perhaps the ET should be revised to reduce the number of hours per day that someone would be present on wildland lands. This would directly affect the standards. Or amend the definition of residential and wildland.</p>	<p>The ministry agrees that the WL ET for human health is based on a residential type exposure. However, it seems reasonable that generally WL are used for residential purposes on a more temporary or seasonal basis compared to the more permanent year round use assumed under the RL defined exposure scenario. Consequently the ministry has proposed an different (i.e. shorter) ET for WL than that used to set RL standards.</p>
113	<p>Appendix A Table A1: - Explanation of the rationale for the Residency Duration for agriculture land use (AL), residential land use (RL), industrial land use (IL) and commercial land use (CL) would strengthen the document and clarify the Ministry of Environment (MOE) intent.</p>	<p>This information is already available on the ministry's website in the 1996 Overview of CSST Procedures for the Derivation of Soil Quality Matrix Standards for Contaminated Sites.</p>
114	<p>Appendix B Table B1: - In the Non-Carcinogens category, the equation of Wildland (WL) may require verification. - It would be beneficial if a rationale for significant difference between the Health Canada Exposure Duration Terms (ETs) and the new proposed CSR ETs is provided. Metro Vancouver is interested to understand MOE's rationale about the intended receptors and the likelihood of exposure for the duration (7d/7d, 52wk/52wk) for urban park land use</p>	<p>Information related to the ET used for Urban Parkland is available on the ministry's website in the 1996 Overview of CSST Procedures for the Derivation of Soil Quality Matrix Standards for Contaminated Sites.</p>
115	<p>For the values in the consolidated Schedule X, both high density residential and wild lands are new land classes. It is noted that only the high density has had the benefit of a formal research study on the background. [...] feels a documentation of exposure pathways used in the derivation of the protective standards for wild lands should be available. There has been considerable discussion of dietary sources of exposure in First Nations and other populations. While a formula for the calculation of wild lands exposure is provided in Schedule 5, is there a plan to provide a full discussion of potential pathways for human exposure in the wild land setting? As a comment, the optimum approach to human and ecological health standards in the province is obtained through close cooperation and the use of comparable standards by OGC and MoE.</p>	<p>No response required</p>
116	<p>In terms of revisions to ensure continued protection of human health, we encourage the government to continue to apply a Ministry of Health clinical study factor for arsenic, lead, and cadmium standards. We submit that this approach provides a realistic estimate of risk and therefore should endure through revisions to the CSST, 1996 protocol.</p>	<p>This issue has been referred to the Ministry of Health. MoE will accept the MoH advice/decision related to the continued use of soil ingestion clinical adjustment factors for arsenic, cadmium and lead.</p>
117	<p>The soil ingestion rates proposed are reasonable; since 2009 there have been several papers providing support that the selected MOE soil ingestion rates (80 mg/day for toddlers; 20 mg/day for adults) are conservative and there is no need to increase soil ingestion rates</p>	<p>No response required</p>
118	<p>Soil ingestion rates they are proposing are reasonable (MOE is correct to not follow the SABCS advice in increasing soil ingestion rates). Since the 2009 SAB document was written, there have been several papers providing support that the selected MOE soil ingestion rates (80 mg/day for toddlers; 20 mg/day for adults) are conservative and there is no need to increase soil ingestion rates</p>	<p>No response required</p>

119	It appears that the MOE proposed soil ingestion rate of 40 mg/day for toddlers at high density RL may be from the report that Golder prepared for the SABCS. It is noted that these soil ingestion rates were developed for ornamental gardens and common areas and were not specifically developed for private yards (that may be at some suburban-style town homes) or playgrounds. Consequently, this soil ingestion rate may not be applicable to all areas at high density RL sties	No response required.
120	Due to lack of mention of the clinical study factor in the draft document, there is concern that the clinical study factor approach may not be retained for arsenic, cadmium and lead. The clinical study factor approach had clear advantages and incorporated real-world evidence on uptake of various substances into people’s bodies (clinical study factor inherently adjusted for aspects such as reduced bioavailability of substances in soil and contact rates with soils through direct measurement). If there is a way of retaining or refining the clinical study factor approach, we think there could be clear advantages. Some of our observations include: o In the case of arsenic, it would seem that the standard will drop by perhaps an order of magnitude if the clinical study factor is not used o In the case of lead, there is no true TDI currently available and so a thoughtful approach will need to be considered o In the case of cadmium, the key concern is what is the proposed approach for sites with garden produce?	This issue has been referred to the Ministry of Health (MoH). MoE will accept MoH advice/decision related to the continued use of soil ingestion clinical adjustment factors for arsenic, cadmium and lead.
121	In Table B1, it is cited that Health Canada supports amortization of “13 weeks/52 weeks” and “35 weeks/52 weeks” for non-carcinogens. Our communication with Health Canada indicates they do not support such amortization and so it is recommended that Health Canada should be consulted and, if it shown to be a misinterpretation, this should likely be corrected so that it does get interpreted as Health Canada guidance	Agreed, MoE contacted Health Canada on this issue and was advised that no such amortization should be assumed. The table will be revised.
122	Might be useful to more specifically document the default relative oral bioavailability factors that will be used. Specifically, in addition to the proposed default of 0.6 for arsenic, there is precedence for 0.8 for lead. Are there any substances where PBET will be considered (e.g., other metals?)	Any bioavailability factors used in setting new standards will be provided in supporting documentation on the derivation of the standards.
123	It may be useful to provide some guidance on how standards are expected to be interpreted when garden produce is grown or edible wild plants are present. For wild lands use sites, similarly wild game presence could be discussed. We realize that prediction of movement of chemicals from soil into biota is extremely difficult and we are not aware of any alternative approaches that would provide reasonable estimates. Nevertheless, it may be useful to explain the issue and the preferred approach for interpretation	Noted.
124	Similar to that discussed for Schedules 6 and 11, sometimes US EPA toxicity reference values (TRVs) are outdated and do not consider the most recent literature. As a result, Health Canada, WHO and other agencies may have more appropriate/recent values in some cases. As an example, US EPA IRIS indicates a reference dose of 0.4 ug/kg bw/d for antimony and indicates that this value was last revised in 1991 ( <a href="http://www.epa.gov/iris/subst/0006.htm">http://www.epa.gov/iris/subst/0006.htm</a> ). However, World Health Organization (2003) indicates a tolerable daily intake of 6 ug/kg bw/d based on a rat study that was published in 1998 (i.e., this study would not have been available to the US EPA at the time their value was established) ( <a href="http://www.who.int/water_sanitation_health/dwq/chemicals/antimony.pdf">www.who.int/water_sanitation_health/dwq/chemicals/antimony.pdf</a> ). Consequently, it would seem that there is a clear rationale for concluding the US EPA TRV for antimony may be outdated. As a result, it is recommended that rather than automatically adopting all US EPA values, a “check” could be completed to ensure that other recognized agencies do not have TRVs that are based on more recent scientific literature that would not have been available to the US EPA at the time of their review. We are not suggesting that there are a lot of substances that fall into this category but there are some and it would seem that alternate values could be considered.	The ministry intends to use the most current and scientifically defensible TRVs obtained from the hierarchy of sources detailed in the omnibus protocol papers. In that regard, to assist the ministry in selecting appropriate TRVs, CSAP has recently agreed to perform the type of TRV check described in the comment and provide the outcome of the check to the ministry.

125	Regarding Table A.1, Protocol element 6, there would seem to be possibility for only evaluating adults as the critical receptor for CL land use. It seems that the current inclusion of children at CL sites is based on the potential for children to be present at hotels and motels, which are currently defined in the CSR as CL. We suggest giving consideration to re-defining hotels and motels as high density RL sites so that the Ministry can justifiably adopt adults as the critical receptor for CL land use. Such a change may be further justified given that some hotels have 'long-term stay' or 'residence inn' options	The ministry acknowledges the possible merit in the suggested changes to the critical receptor for RL and CL land uses. However, time constraints preclude further consideration of such changes for the Stage 10 amendment. This issue will be re-visited in a future cycle of standards updating.
<b>Soil to Water Pathway Standards</b>		
126	Will the updated standards be calculated using the new groundwater model?	Yes.
127	Tell us more about the groundwater model.	The general concepts and principles of the Groundwater protection model are provided in the 1996 CSST Protocol.
128	What are the major changes proposed for the GW model?	The major proposed changes to the groundwater model include: updated receptor concentrations (water use standards from Schedule 6); revised soil type (slightly less permeable); change to steady-state saturated zone transport solution from current transient solution; adoption of EPA Soil Screening Guidance (SSG) distribution coefficients (Kd's) for select inorganic substances; development of updated Kd isotherms for copper and lead using EPA SSG defaults and using the Multimedia, Multi-pathway, and Multi-receptor Risk Assessment (3MRA) modelling system; updated biodegradation rates for select organic substances; removal of biodegradation rates for chlorinated solvents (tetrachloroethylene and trichloroethylene); adoption of a solubility constraint (50% of theoretical solubility) for organic substances; and, a revised organic carbon partitioning coefficient (Koc) isotherm for pentachlorophenol. Changes to the model interface are also proposed to promote greater ease of use and transparency of the model.
129	Soil matrix standards include the protection against possible effects to receptors/water uses (aquatic life, irrigation, and livestock watering), when soil contamination affects water and subsequently affects the receptor (e.g. aquatic life) or water uses (e.g. irrigation, livestock watering). Water standards from Schedule 6 are used to back-calculate soil concentrations that are protective of groundwater. Does this take into account that Schedule 6 standards require a minimum of 1:10 dilution to be available?	Yes. The matrix numerical soil standards for the soil to water pathways are back-calculated based on receptor concentrations which are sourced from the water use standards provided in Schedule 6. As noted, the Schedule 6 aquatic life water use standards incorporate a 10 times dilution factor. This is incorporated in the model by specification that the aquatic life water use standard is applied at 10 metres from the high water mark of an aquatic receiving environment. This provides a buffer zone for attenuation of groundwater concentrations exceeding water quality guidelines prior to discharge to a receiving environment. This approach is consistent with Technical Guidance 15 and is to be clarified in the model framework documentation. It is acknowledged that this buffer zone may not be protective in all cases. However, as a conservative measure for the majority of cases, a buffer zone is considered sufficiently protective for the purposes of calculation of generic standards.
130	Does BC CSR provide guidance on whether actual groundwater data supersedes the soil matrix standard for groundwater protection? I.e. if soil is contaminated above the "groundwater to surface water used by aquatic life" matrix standard, but actual groundwater samples (from the same location) is below the Schedule 6 water standards does the soil matrix standard still apply? Is soil remediation required?	The Schedule 5 soil matrix standards represent default (walk-away) soil standards for determination and remediation of a contaminated site to numerical standards and are therefore conservative by design. As a result, where investigation and/or remediation is undertaken to numerical standards, soil and groundwater concentrations are assessed and remediated independent of the other. Accordingly, use of groundwater concentrations to override soil concentrations is not permissible under a numerical approach but may be considered under a risk-based approach. Such an approach is currently possible under Detailed Risk Assessment and is also under consideration for incorporation in Screening Level Risk Assessment (Protocol 13).
131	Harmonization of the proposed Groundwater Protection Model (GPM) with CCME is mentioned (pg. 3), yet numerous items listed in Table A1 appear sourced from other agencies.	Yes, harmonization with the CCME model is proposed in so far as possible. As noted, differences between the BCE and CCME models are proposed to remain as not all conditions and approaches in the CCME model are consistent or representative for application in BC.

132	The 2010 CCME PAH guidelines are also (partly) based on back-calculating soil quality guidelines from water quality guidelines – presumably using the CCME 2006 model/protocol (?). The resulting matrix guidelines are for Naphthalene and Phenanthrene are very conservative. The 2010 CCME PAH guidelines acknowledge (see CCME footnote f): “modelling assumptions include the absence of biodegradation of PAHs in the subsurface environment, a highly conservative assumption”. The conservative naphthalene and phenanthrene guidelines are often below the level of detection practical at contaminated sites. Also, these very low guidelines are often the only guidelines exceeded at a federal site that is otherwise clean.	Naphthalene and phenanthrene are proposed to be added to the model for calculation of matrix numerical soil standards. Other low molecular weight PAHs may also be included, time permitting. Based on a literature review, a biodegradation rate is proposed to be included for naphthalene, while for phenanthrene, a decay value is not proposed to be included similar to CCME. Based on the low water use standards for these substances, calculated soil concentrations are anticipated to be low although not necessarily below detection limits based on the increased sorption of PAH substances as compared to other substances with low water use standards (e.g., benzene). Regardless, in accordance with CSST model policy, any calculated soil concentrations that are below analytical detection limits are automatically adjusted to the detection limit.
133	References to “Protocol 21”: Important to know what, if any, stakeholder comments on the draft Protocol 21 will be incorporated into the final document.	Updating of Protocol 21 is being conducted independent of the omnibus project. Accordingly, the lead author for updating of Protocol 21 should be contacted for specific information.
134	Coarse Grained Soil Definition (Pg. 5, #2.a.)  “Modify the existing soil type used in the model to be more broadly representative of coarse-grained soil conditions in BC...” What do we mean by “more broadly representative”? The existing model should already be working for coarse-grained soil.	The current soil type in the model is based on the Fraser River Sediments in the Lower Mainland region of BC. The soil type is representative of a medium-grained sand which is considered a coarse-grained soil type (as opposed to a fine-grained soil type). The proposed new soil type is slightly less permeable than the Fraser River Sediments and is also generally consistent with the CCME coarse-grained soil type. The proposed new soil type is deemed more broadly representative of BC conditions, as opposed to limited to the lower mainland, based on the varying fluvial and glacial depositional environments throughout BC.
135	Linear Velocity.  Is the minimum allowable velocity not currently 5 m/year? If the minimum will be revised, what is the basis for doing so and what will the new minimum be?	A default groundwater velocity value is used in the model. The default value may be modified under Protocol 2 (Site-Specific Soil Standards). The current minimum velocity allowable in Protocol 2 is 5 m/year. However, this is a Darcy velocity (independent of soil effective porosity) which is lower than the average linear groundwater velocity (incorporates soil effective porosity). Accordingly, the proposed change, for harmonization with Protocol 13, is to prescribe the minimum allowable groundwater velocity of 5 m/year in Protocol 2 as the average linear groundwater velocity. The net result under Protocol 2 is an allowance for an approximately 5 times lower groundwater velocity.
136	Next Cycle Revisions Porewater (Pg. 7, #3). Porewater:  “Evaluate incorporation of pore-water standards...”. Why would pore-water standards be any different from water standards? What is the benefit of incorporating pore-water standards as a separate set of standards?	As recommended by the SABCS, pore-water standards would differ from groundwater standards by the application of a dilution factor to account for subsurface attenuation processes. As noted in the ministry discussion paper, this concept is not part of the current omnibus updating project but may be considered in a future update.
137	Next Cycle Revisions: Porewater for Invertebrates (Pg. 8, #13)  Evaluate practicality of, and need to, develop soil standards based on porewater to protect soil invertebrates” ...soil standards are/should be based on water standards that are protective of soil invertebrates. Similar to the comment above, why should it be different for porewater compared to water?	Current soil standards for the protection of soil invertebrates (toxicity to soil invertebrates and plants site-specific factor in Schedule 5), are based on direct toxicity of invertebrates to soil. Inclusion of toxicity to soil invertebrates based on exposure to pore-water would be an additional pathway of toxicity assessment. As noted in the ministry discussion paper, this concept is not part of the current omnibus updating project but may be considered in a future update.
138	Wildlife Surface Water Ingestion (Pg. 8, #15)  “...for the purpose of protecting wildlife surface water ingestion (i.e., wildlife drinking water pathway)” ...do we foresee any significant difference in toxicity to wildlife compared to toxicity to livestock (the latter being already known) based on specific animal species? If not, the effort may be redundant.	The prospective exposure pathway has not been evaluated in detail to date. Accordingly, and as noted in the ministry discussion paper, this concept is not part of the current omnibus updating project but may be considered in a future update.
139	Currently, application of DW standards is default unless it can be demonstrated by means of characterization of hydrogeological parameters of the aquifer that shows a water supply is not sustainable. There are other circumstances where water is not suitable as a drinking water source, in particular when the water contains chemicals that exceed drinking water standard. If naturally occurring chemicals are present in the water and cause the water to be unsuitable for drinking without treatment, then the water should be considered non-potable and comparison standards should be a non-potable standard. The use of the water for drinking will require treatment no matter what and the use would be avoided if possible.	The issue raised is unrelated to the groundwater model and omnibus project. Rather, the issue speaks to determination of applicable water uses. Accordingly, the query should be raised with the author of Protocol 21.

140	I see that there was no mention of the linked parameter sets in Appendix A. There was a comment though that a site-specific foc could be used but it is in a linked parameter set with 10 other parameters. That would mean that those 10 other parameters would also have to be site-specific and default values cannot be used which I find a bit unreasonable. Can you provide rationale on why the linked parameters are necessary? Does the CCME protocol have the same requirement?	The query relates to calculation of site-specific soil standards under section 3.2.9 (Method I) of Protocol 2. The ministry acknowledges that the current Method I of Protocol 2 is cumbersome and refinements/improvements to promote greater usability and functionality are warranted and should be considered. Accordingly, the ministry proposes to update Protocol 2 as part of updating of the groundwater model. As part of this updating, the ministry is considering soliciting input from, and possibly striking a working group with, the CSAP Society for revision of the protocol as CSAP members are the most likely users of the protocol. Note however that possible changes to Protocol 2 will be considered after the Stage 10 amendment is approved, and ideally before the "Coming into Force" of the new standards.
141	Saturated Zone transport – decay values for organic substances – Consideration of the soil types for the biodegradation decay values (i.e. soil type (sand/clay/etc.), pH, organic matter content, etc.) would strengthen the overall approach.	While it is acknowledged that there may be some variation in decay rates of organic substances based on soil type and conditions, a single default biodegradation rate value is used in the model as a conservative measure given the desired conservative nature of the model as used for the calculation of matrix numerical soil standards. Modification of the default decay values is also not proposed to be included in Protocol 2 (Site-specific Soil Standards) as determination of a site-specific decay rate requires sufficient technical expertise and is best assessed under a risk-based approach. For reference, a site-specific decay rate may be determined using the draft guidance prepared by King Groundwater Science, Inc. for the SABCS titled "Hydrogeological Assessment Tools to Determine the Rate of Biodegradation for Organic Contaminants in Groundwater" dated November 2005.
142	Infiltration rate – Approach implemented in Protocol 4 – Soil Background Concentrations, i.e. development of an infiltration rate for certain areas of BC may prove advantageous, compared to a default value based on the Lower Mainland.	It is acknowledged that the model is sensitive to the Infiltration Rate value with higher soil standards calculated for lower Infiltration Rate values. A default Infiltration Rate value is proposed to be retained in the model based on the conservative nature/purpose of the model. However, it is noted the infiltration Rate may be modified under Protocol 2 thus allowing for the desired functionality. The ministry proposes to update Protocol 2 as part of updating of the groundwater model. As part of this updating, the ministry is considering soliciting input from, and possibly striking a working group with, the CSAP Society for revision of the protocol as CSAP members are the most likely users of the protocol. Note however that possible changes to Protocol 2 will be considered after the Stage 10 amendment is approved, and ideally before the "Coming into Force" of the new standards. The above-mentioned streamlining of Protocol 2 should aid in the use of model for calculation of site-specific soil standards.
143	It can be anticipated that the Groundwater Model output will yield some low and potentially impractical soil standards for some compounds. Assuming this to be the case, then the practical standard may revert to a background value, such as those tabulated for metals across the province as presented in Protocol 4 (we recommend that these be expanded and updated), or use of Protocol 2 (for example, conducting a site-specific leachate test). Given that Protocol 2 has been rarely used in the past, there is a need to make the protocol easier and more practical to use.	
144	Section 4.1, Aquatic Life (AL) water use at 10m from the receiving environment:  It is suggested to provide additional discussion on how to define the border of the receiving environment (e.g. high water mark or edge of 1 in 100 year flood zone). Example of such discussion can be found in page 9 of "Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (2010)".  Furthermore, it may be beneficial to provide additional discussion on possible exceptions to the generic "10 m rule" such as in case of highly coarse materials, fractured bedrock, and/or very high groundwater velocity.	Current ministry guidance on application of aquatic life water use in relation to a receiving environment is provided in Technical Guidance 15. It is acknowledged that more detailed information is presented in the referenced Federal Contaminated Sites Action Plan document on the matter than presently in TG15. Accordingly, the ministry will consider updating of TG15 once the Stage 10 amendments are approved and ideally before the "Coming into Force" of the new standards.
145	How is the GPM integrated with the background models recommended for the monitoring associated with MNA? Has the additional delineation of groundwater required for an MNA baseline been included? Is the GPM still based on a two dimensional model?	The groundwater model is used for calculation of soil standards to protect groundwater and therefore differs in purpose to models used for modelling associated with MNA. However, there are similarities in model formulation. According to the draft ministry MNA guidance, a variety of models may be used for the modelling associated with MNA. One such model is BIOSCREEN developed by the USEPA. It is noted that the saturated zone transport component of the groundwater model uses the same transport equation as that in BIOSCREEN. The saturated zone transport equation is two-dimensional with prediction of groundwater concentrations along the plume centerline.
146	In back-calculating impacts on surface water through aquifers the tenfold dilution factor may not provide sufficient protection in estimating actual concentrations that reach surface water	The ministry concurs with the summary statement and adds that the minimum dilution attenuation factor (DAF, degree of attenuation between the source and a receptor) available in the current model formulation is approximately 3.3 for the DW, IW and LW pathways and approximately 33 for the AW pathway. The higher DAF for the AW pathway is due to the additional 10 times dilution factor in the AW water use standard. These minimum DAFs apply primarily to inorganic substances. Higher DAFs are available for organic substances where decay and sorption may be active during saturated zone transport. Overall, the DAFs are considered to be sufficiently conservative for calculation of default matrix numerical soil standards.

147	<p>Degree of Conservatism</p> <p>The planned changes will incorporate a significant degree of conservatism through use of the model defaults for various hydrogeologic conditions. Because the defaults are single values for each variable, the degree of conservatism will vary, depending on site location across the province. For example, the default infiltration rate (55% of 1.0 m of precipitation, or about 0.55 m) may be reasonable for the Lower Mainland, but is probably much too high for areas of the province where total precipitation rarely exceeds 0.5 m, and too low along the north coast where precipitation exceeds 1.5 m. As illustrated in the attached sensitivity analysis for benzene, which allows for bio-decay and sorption, infiltration rates can have a profound influence on calculated standards, whereby low infiltration yields a much less stringent standard for benzene.</p> <p>In total, the current defaults result in a dilution attenuation factor of about 3.3. While this appears reasonable, SAB (2005) noted that USEPA concluded that a DAF of 20 was more realistic. However, for the BC case, when a DAF of 3.3 is considered together with a dilution factor of 10 between groundwater standards and water quality guidelines at receptors, then the proposed DAF appears reasonable.</p>	<p>The ministry concurs with the summary statement and adds that the minimum dilution attenuation factor (DAF, degree of attenuation between the source and a receptor) available in the current model formulation is approximately 3.3 for the DW, IW and LW pathways and approximately 33 for the AW pathway. The higher DAF for the AW pathway is due to the additional 10 times dilution factor in the AW water use standard. These minimum DAFs apply primarily to inorganic substances. Higher DAFs are available for organic substances where decay and sorption may be active during saturated zone transport. Overall, the DAFs are considered to be sufficiently conservative for calculation of default matrix numerical soil standards.</p> <p>The ministry also notes that consideration of site-specific DAFs for a particular site is best handled under the Protocol 2 Site-Specific Standards or the Risk Assessment/Risk Management approaches available under the Regulation.</p>
148	<p>Consequences of the Process</p> <p>Currently, depending on the nature of the constituent, it looks like there are several (at least three) changes that will drive the soil standards lower (i.e., more stringent), and at least two that will drive them higher. It appears that substances susceptible to bio-decay and sorption (e.g., benzene) will have less stringent standards, whereas substances such as some of the metals will have lower, more stringent standards based on revised Kds and lower Schedule 6 standards.</p>	<p>In general, such changes may be realized although the net overall changes may vary between substances or substance classes based on the overall proposed model changes. The net overall changes to soil standards will be determined in the next phase of the omnibus update project with calculation of the proposed new soil standards based on incorporation of the final proposed model changes.</p>
149	<p>Given the above, it can be anticipated that the model output will yield some low and potentially impractical soil standards for some compounds. Assuming this to be the case, then the practical standard may revert to a background value, such as those tabulated for metals across the province as presented in Protocol 4 (we recommend that these be expanded and updated), or use of Protocol 2 (for example, conducting a site-specific leachate test). Given that Protocol 2 has been rarely used in the past, there is a need to make the protocol easier and more practical to use. CSAP and/or MOE should provide guidance on using a revised Protocol 2 and include, for example, tools such as nomographs or look-up tables, for specific variables such as water table depth, infiltration rate, and foc, negating the need to collect heaps of site-specific data in order to develop a site-specific alternative standard.</p>	<p>It is acknowledged that the model is sensitive to the Infiltration Rate value with higher soil standards calculated for lower Infiltration Rate values. A default Infiltration Rate value is proposed to be retained in the model based on the conservative nature/purpose of the model. However, it is noted the infiltration Rate may be modified under Protocol 2 thus allowing for the desired functionality. The ministry proposes to update Protocol 2 as part of updating of the groundwater model. As part of this updating, the ministry is considering soliciting input from, and possibly striking a working group with, the CSAP Society for revision of the protocol as CSAP members are the most likely users of the protocol. Note however that possible changes to Protocol 2 will be considered after the Stage 10 amendment is approved, and ideally before the "Coming into Force" of the new standards. The above-mentioned streamlining of Protocol 2 should aid in the use of model for calculation of site-specific soil standards.</p>
150	<p>SAB (2005) made several recommendations and many are being considered in the updated CSST model. The following four (#11, 12, 18 &amp; 19) are quoted below and commented upon further: <b>11</b>. Consideration should be given to regulatory framework that includes pore-water standards and a protocol where the results of leaching tests can be compared to pore-water standards. For metals, pore-water standards and leaching tests would avoid some of the scientific issues and uncertainty associated with the Kd approach. <b>12</b>. To gain further inside on the predictive capability of the metals partitioning model, it is recommend that soil and near-contaminated source groundwater quality data from contaminated sites in the British Columbia be evaluated to provide for field-based estimates of groundwater fate and transport, and indirectly partitioning behaviour <b>18</b>. The combination of decay (half-life) and sorption (Koc, foc) have a significant effect on model-predicted organic groundwater concentrations at 10m from the source. Once representative half-lives have been selected it is recommended that the steady state model be run to evaluate the effect of these two parameters. The simulation results, together with the mixing model results, should be used to derive example soil standards (i.e. similar to metals Table 2.3 described earlier). The results should be carefully assessed to evaluate whether incorporation of these fate and transport processes is reasonable for generic soil standard development purposes. <b>19</b>. The CSST protocol should be revised to include a check based on slumbility considerations assuming a single chemical is present (no co-solubility) effects. If the acceptable pore-water concentration at the contamination source exceeds the pure-chemical solubility, then no soil standard would be possible for that chemical. SAB recommendations 11 and 12 relate primarily to metals. As noted above, in anticipation that</p>	<p>SABCS recommendations 11 and 12: The ministry concurs that the SABCS recommendations warrant further review and consideration. To aid in addressing recommendation 11, leaching tests are proposed to be specified in Protocol 2. With respect to the remaining aspects of the recommendations, based on the limited resources and time available for the omnibus updating project, they are proposed to be evaluated as next cycle revisions. As noted elsewhere in this document, options are available for assessment of inorganic substances in the BC regulatory regime.</p> <p>SABCS recommendation 18: Similar to above, based on the limited resources and time available for the omnibus updating project, this issue is proposed to be evaluated as next cycle revisions.</p> <p>SABCS recommendation 19: Agreed. A 50% solubility constraint for organic substances is proposed as part of model updating. Evaluation of use of substance effective solubilities based on mixtures is proposed to be evaluated as next cycle revisions.</p>

	<p>metals standards may be problematic, it is recommended that these be acted upon.</p> <p>With respect to SAB 18 and 19, it is noted, and we concur, that the results of the model should be considered “example standards”, and should be carefully examined to see if they pass the “reasonableness” test.</p> <p>With respect to a solubility check, we note that the model compares leachate concentrations to 50% of the single “pure-phase” solubility of a substance. Caution is advised in that solubilities of substances in NAPL mixtures have reduced maximum solubilities in approximate proportion to their mole fraction in the NAPL. For example, while the pure-phase solubility of benzene is about 1,800 mg/L, its molefraction in gasoline is less than 1%, and its effective solubility is thus about 18 mg/L or less. Where PAHs are found in NAPLs such as creosote, the PAHs are in a liquid form whereas the textbook solubilities are for the solid form. For example, for naphthalene, its pure-phase solid solubility is about 36 mg/L; its super cooled liquid solubility is about 100 mg/L, and for creosote with a 10% mole fraction of naphthalene, the effective solubility will be about 10 mg/L. The selection of 50% of the pure-phase solubility is likely conservative for most situations, but perhaps not for all.</p>	
151	<p>It has been suggested by some that groundwater standards should take into account the effects of a pumping well in diluting contaminated water prior to extraction and use. In my view, this is not reasonably conservative. There should be no dilution factor because not all extraction wells pump continuously. For example, a small well may only pump a few times a day, allowing any plume to re-establish around the well screen.</p>	<p>The ministry concurs that application of a dilution factor to drinking water guidelines, for the purposes of calculation of drinking water standards, is not supported or justified based on presently available information.</p>
152	<p>MOE is probably doing this already, but George should have a peer hand check the Excel model for an organic and inorganic parameter, i.e. run through the calculations independently to make sure the cell operations are working.</p>	<p>Agreed. The updated model will be subject to internal QC checking.</p>
153	<p>The Kds that come from the US EPA seem like a very comprehensive source. It is noted that the EPA used this model to derive soil screening values, not legally enforceable standards and MOE must recognize this difference in policy/approach.</p>	<p>As the BC regulatory regime is based on legally enforceable standards, soil distribution coefficients (Kd's) are, in effect, used in the calculation of soil standards. However, in consideration of the uncertainties inherent in the use of Kd values, options for alternate assessment and remediation of inorganic substances are provided in the BC regulatory regime. These include development of site-specific soil standards using leaching tests under Protocol 2 and undertaking a risk-based approach.</p>
154	<p>US EPA derived Kds based on assumed values for foc and iron oxide (FeOx) concentrations in US soils. MOE and CSAP should consider assembling a database for these parameters for BC soils to see if they are similar.</p>	<p>Assembling such a database will be considered as part of next cycle revisions.</p>
155	<p>US EPA had their work on deriving Kds peer reviewed. The reviewers noted that Kds for barium and zinc could not be reproduced for all test conditions. MOE may wish to consider this limitation for these parameters.</p>	<p>The peer reviewer comments were evaluated by the USEPA and published as part of the EPA SSG document. It was determined that the peer reviewer's input files contained incorrect data entries. Once corrected, the Kd values could be reproduced using the peer reviewer's input files. Accordingly, changes to the EPA Kd values for barium and zinc were not necessary.</p>

156	<p>Based on our understanding of the model, the most sensitive parameters appear to be as follows:</p> <ul style="list-style-type: none"> <li>o For an organic constituent: <ul style="list-style-type: none"> <li>-Bio-decay rate</li> <li>- Depth below source to water table</li> <li>- Sorption</li> <li>-Groundwater velocity</li> </ul> </li> <li>o For an inorganic constituent <ul style="list-style-type: none"> <li>- Kd</li> <li>- pH</li> </ul> </li> </ul> <p>The sensitivity of the model for most of these parameters was examined in some detail by SAB (2005). The effect of varying some of these parameters was re-examined herein. The model was run for the ranges of parameters as follows:</p> <p>Constituents:</p> <ul style="list-style-type: none"> <li>o Arsenic, benzo(a)pyrene (BaP), benzene, cadmium</li> </ul> <p>Groundwater Velocities:</p> <ul style="list-style-type: none"> <li>o 10, 50, 100 m/year</li> </ul> <p>Depth to Water:</p> <ul style="list-style-type: none"> <li>o 0m, 5m, 10m</li> </ul> <p>Infiltration Rate:</p> <ul style="list-style-type: none"> <li>o 0.1m, 0.5m, 1.0m</li> </ul>	<p>While the ministry could not reproduce all of the sensitivity analysis results presented in the CSAP review, possibly as a result of the limited information provided on data input values, the ministry notes that the CSAP analysis provides a high level overview of how the model may be used under Protocol 2 for the calculation of site-specific soil standards. The CSAP analysis also confirms the need for streamlining and clarification of Protocol 2 use/input requirements for calculation of site-specific soil standards.</p>
<b>High Density Residential Soil Standards</b>		
157	<p>Minimum of three floors: Rationale? How do properties with, for e.g., some apartment buildings with a portion of the property occupied by townhouses at grade with &lt;X (e.g. 2) floors&gt;, get considered if the bulk of the parcel is occupied by a high-rise with either residential or commercial at grade?</p>	<p>The rationale for HDR, including the criterion requiring three or more stories or floors, is based on the HDR report by Golder and SABCS. This recommended criteria is generally supported by stakeholders as an appropriate and easily applied criteria to determine HDR land use.</p> <p>Please note that as has been long-standing ministry policy, a property which is comprised solely of commercial use at ground level will continue to be considered a commercial land use [CL] site. Please also note that mixed low and high density residential properties will be considered to be low density residential properties.</p>
158	<p>Minimum of three floors: - Rationale in unclear. -How do properties with, for e.g., some apartment buildings with a portion of the property occupied by townhouses at grade with &lt;X (e.g. 2) floors&gt;, get considered if the bulk of the parcel is occupied by a high-rise with either residential or commercial at grade? - Canadian Fuels suggests that the Residential High Density criteria should instead be a density calculation based on the number or residents and exposed surface soil, and we would appreciate further discussion to better understand the rationale behind this definition. - The proposed category of high density residential seems ambiguous and basing it on building height seems arbitrary. Typical R1 zoning has a specified portion of building footprint to lot size. If the site is paved then this portion will be 100% building.</p>	<p>The rationale for HDR, including the criterion requiring three or more stories or floors, is based on the HDR report by Golder and SABCS. This recommended criteria is generally supported by stakeholders as an appropriate and easily applied criteria to determine HDR land use.</p> <p>Please note that as has been long-standing ministry policy, a property which is comprised solely of commercial use at ground level will continue to be considered a commercial land use [CL] site. Please also note that mixed low and high density residential properties will be considered to be low density residential properties.</p>
159	<p>Low Density Residential Definition Appendix A provides an example of a possible revised definition for low density residential land use which includes a shack, hut or tent. The definition also indicates the dwelling can be temporary or seasonal. The residential exposure terms are much too conservative for shack, hut or tent dwellings which would likely be temporary or seasonal dwellings.</p>	<p>The classification of Residential Land [RL] as any dwelling where people sleep and reside (including on a temporary or seasonal basis) other than hotels and motels (which are considered commercial) reflects the CSST 1995 policy decision related to residences. The ministry does not propose to re-open the CSST decision.</p>

160	Use building height not family units to differentiate between high and low density residential land use. Definition illustration of low density residence states “housing a single person or a single family” but also allows for apartments, flats, boarding houses, condominium, townhouse etc. that are less than 3 stories with multiple families. Our concerns are that the high density standards will be used in situations there are low-rise multi-family development.	Agreed. The draft definition of a low density residential land use will be revised to read:  “residential land use” [RL] means <i>the use of land for the primary purpose of:</i>  <i>(a) a low density residence [RL<sub>LDR</sub>] housing a single person or a single family, on a permanent, temporary or seasonal basis, in a common single unit dwelling comprising two or less stories or floors, including without limitation: ...</i>
161	Proposed definition for high density refers to multi-family, with more than 3 storeys, low density refers to single family dwelling. Definition would benefit from clarifying what standard applies to multi-family housing less than 3 stories.	
162	Clarify definition of high density residential.	The definition of residential land use will be revised to clarify that the primary criteria differentiating low density and high density residential land use is the number of stories or floors which comprise the dwelling.
163	Does the high density definition deviate from the SAB recommendations?	No, the narrative definition of high density residential land use is in alignment with the SABCS recommendations.
164	What is rationale behind High Density Residential definition?	The rationale for HDR is based on the HDR report by Golder & SABCS. Please also note that mixed low and high density residential properties will be considered to be low density residential properties.
165	The document would considerably benefit from clarification regarding the footnotes, for example: <ul style="list-style-type: none"> <li>One of the footnote states “Standard assumes use of the land as a children’s playground, campground, sports field, picnic area or any other use that promotes frequent contact by children is prohibited.” Since several condo/townhouse developments have children’s playground/play areas or are in process of installing them, this may be impractical. It would also be helpful if the document offered a suggestion of what would be the appropriate standards to use in these instances.</li> </ul>	Footnotes in Schedule X relate to conditions associated with the application of the LDR/HDR standards, not the legal definition of these land uses. Residential land that does not meet the criteria (i.e. less than 3 stories or floors) for HDR will be considered to be LDR.
166	Footnotes proposed for soil matrix standards provide more specific information. Consider including this in the land use definition?	
167	Our society notes that the ecological standard for high density residential has been set at the commercial level. At the time of the HDUR Golder/SABCS study in 2011 there was considerable discussion of exposure pathways related to toddler ingestion of dust which was derived from adjacent lands. Has the Ministry considered the additional exposure of the toddler in cases where playgrounds (elevated) are not permitted? (Toddlers without playgrounds find the nearest vacant land to play on). Our society would recommend that guidance be provided for proponents of developments in this land class which facilitated the provision of safe environments for children’s play using elevated structures.	The Ecological health protection standards are specific to ecological health, not human health. This concern related to toddler's exposure on "non-playground" wildlands soil is more appropriately addressed by the human health soil ingestion RL <sub>HDR</sub> standard which is based on the child (toddler) as the critical receptor.
168	More information on how to address playgrounds/gardens would be beneficial – especially given that daycares in 3 storey buildings are mentioned in the high density residential definition. Daycares are typically on the bottom floor and include an outside playground. You may wish to consult Health Canada in this regard.	The CSR currently classifies land used for daycares as residential land use [RL]. If an RL site (e.g. a daycare) includes a playground or any other prohibiting criteria provided in a Sch X footnote related to high density RL, the site will be considered to be a low density RL site.
169	Providing further clarification/distinction of what is residential compared to commercial would be useful (e.g. often the ground floor of a 3 storey+ building is commercial, is this considered commercial/not residential? Clarify definition of High Density Residential (i.e. why 3 stories and not 2)?	As has been long-standing ministry policy, a property which comprises solely of commercial use at ground level will continue to be considered to be a commercial land use [CL] site.  The criteria for HDR requiring three or more stories or floors was adopted on the recommendation of the Golder/SABCS HDR report and is generally supported by stakeholders as an appropriate and easily applied criteria to determine HDR land use.
170	Can we assume that if a residential site does not qualify as HDR, the default land use will be LDR?	Yes.
171	The proposed exposure term for High Density Residential scenario (e.g., less conservative soil consumption rates) seems intuitively reasonable if residences where residents have regular exposure to soil (e.g. playgrounds, vegetable gardens, etc.) are excluded from the HDR scenario. The rationale, however, for the assumed soil ingestion (half that of LDR) is unclear. Can	The rationale for HDR is based on the Golder/SABCS HDR report.  The responsibility for maintaining the applicability of the land use standards (and any conditions inherent in the exposure

	<p>MOE provide the evidence base for this decision? Furthermore, many municipalities are unlikely to have zoning protocols that will recognize the difference between LDR and HDR subcategories. In addition, this condition on land use will need to be passed between landowners. How will MOE ensure that these new land use scenarios (and their specifications) will be implemented by municipal planners, developers and individual landowners over the long-term? For example, are municipalities prepared to ensure that owners of sites remediated to a HDR land use only (i.e., not permitted to have a playground, vegetable garden, or other use that promotes frequent soil contact by children) are not allowed to build a LDR building on the site in the future?</p>	<p>assumptions related to the land use standards to which a contaminated site is remediated) lies with the responsible person(s) for the site. If the ministry determines that the nature of a remediated site has been altered to such an extent that the land use standards upon which remediation of the site was based no longer apply, any instrument (e.g. CoC) issued for the site may be rescinded.</p>
172	<p>The Schedule 5 proposal comments that the HDUR soil invertebrates and plant number will be set to one half of the CL value per the derivation methodology proposed separately for the HDUR land use. The HDUR derivation proposal cites the summary paper from Golder (2015) as the basis for the decision to use one-half the CL standard. Golder (2015) did not recommend that the soil invertebrate and plant standard be set to one-half the CL standard. Golder (2015) recommended that the protection of human health standard for HDUR be based on an exposure time of 0.5 because the expected play activities leading to human exposure would occur at a rate of roughly 50% of typical residential sites. a) Golder (2015) specifically recommended that there was sufficient similarity in terms of habitat utilization by soil invertebrates and plants between the HDUR and CL land use to justify the use of CL numerical standards for the HDUR land use.  b. This was also the position taken in SABCS (2005; page 163) which was the predecessor document to SABCS (2009).  c. SABCS (2009) modified the recommendation from SABCS (2005) by proposing a derivation method that included the HDUR land use as equivalent to the RL/PL (as shown on the figure reproduced in the Schedule 5 proposal). SABCS (2009, Volume 1, page 20). SABCS (2009) articulated this decision in the context that a HDUR site warranted the same level of protection as an urban park (paraphrased as ‘most species will be able to survive with some loss of productivity, conserves interactions between major taxonomic group, and protects property values associated with urbanized landscapes’).</p>	<p>The original recommendation from the 2011 SAB document was to have the CSR CL standard apply for the ecological receptors (Toxicity to soil invertebrates and plants) for High Density Residential land use. The ministry will clarify that the EH soil invertebrate and plant standard for RL<sub>HDR</sub> will be set to equal the CL standard.</p>
173	<p>The proposed derivation for WL, AL/RL/PL, and CL/IL will be the EC15, EC25 and EC50 values from the regression line, respectively. A separate topic regarding this derivation method is described elsewhere. Using a one-half decision rule for HDUR sites appears to diverge from the underlying principle that the level of protection will scale according to land use because one-half of the CL standard could result in different ECx equivalent for each substance depending on the slope of the regression line. Two options are proposed as alternatives:</p> <ul style="list-style-type: none"> <li>a) Select either the AL/PL/RL value or the CL/IL standard as the HDUR standard based on a policy decision regarding the desired level of protection. There appears to be more similarity in the desired level of protection between CL and HDUR than between RL and HDUR, assuming that the HDUR land use is not applied to sites where soils are being used to grow vegetable for human consumption.</li> <li>b) If the policy decision is that HDUR sites warrant an intermediate level of protection between CL and RL, use the EC37.5-based number for transparency and consistency amongst different substances. However, please consider that proposed derivation method involves binning data in quartiles or quantiles. This results in a reduction in the discriminatory power between an EC25 or an EC50-based value from the regression line relative to the underlying distribution of toxicological data (i.e., the underlying data cloud is less likely to have an EC37.5-based value that is statistically different from either the EC25 or EC50-based value if the regression was calculated from the underlying data instead of the quartile/quantile regression line). Consequently, deriving a EC37.5-based value will not necessarily result in an actual difference in the level of protection.</li> </ul>	

Wildlands Land Use		
174	With the new Wildland standards for soil vapour, does this imply that soil vapour assessment must now be completed on all WL sites, regardless of a presence of a building (where use is more than 2hrs/day) within 30 m of the site (current exemption). This will have huge implications if soil vapour must be completed on all O&G sites on crown land. There should be exemptions for O&G sites like a drill and abandoned (D&A) site where there are very low risks and minimal, if any contamination.	The ministry has decided to defer development of vapour standards for Wildlands to a future cycle of standards review/updating.
175	How do developers manage the wildland standard in urban areas?	Developers will be expected to utilize the wildland standards if their land use is consistent with the definition of wildlands from CSR (1):
176	Please clarify between urban park and wildland definitions i.e. a sentence or two to describe when urban park vs wildland would apply particularly with respect to riparian areas. Perhaps move to next cycle? i.e. take five years to come up with this definition	<b>“Wildlands land use”</b> [WL] means: <i>the use of land for the primary purpose of supporting natural ecosystems including, the use of land for ecological reserves, national or provincial parks, protected wetlands or woodlands, native forests, tundra and alpine meadows, but does not include uses defined as urban park land use.</i>
177	What is the definition of wildlands?	<b>“Urban park land use”</b> [PL] means: <i>the use of urban land for the primary purpose of outdoor recreation including, without limitation, municipal parks, fairgrounds, sports fields, rifle ranges, captive wildlife parks, biking and hiking areas, community beaches and picnic areas, but does not mean wildlands such as ecological reserves, national or provincial parks, protected wetlands or woodlands, native forests, tundra and alpine meadows.</i>
178	Can you further define wildlands?	[Source – Section 1, Contaminated Sites Regulation]
179	The wildlands occupancy of 6 months/year does not seem "real world", why did you select that exposure term?	The ministry feels the defined human health exposure scenario for the WL land use (i.e. camping in natural WL), which assumes that in general people would not camp-out in WL for more than 1/2 the year, represents a reasonable estimate for maximal exposure. Note that further refinement of the ministry's assumed WL default Exposure Term may be necessary in consequence of pending consultations with 1 <sup>st</sup> Nations.
180	Our agency supports the creation of a new land use scenario for Wildlands. This may provide greater protection for First Nations and recreational land users who may not have been previously recognized as potentially exposed receptors in CSR HHRAs. However, our agency would advise against applying a default of 26wk/52wks exposure duration to all substances as some chemicals will have toxic effects in a matter of weeks/months. Amortizing 26 weeks of exposure over an entire year will halve the receptor's estimate dose and potentially underestimate the effect of a chemical that may be toxic over a shorter period of time. Furthermore, most derivations of RfD's or TRV's (whether through animal testing or epidemiological studies) applied in the CSR do not reflect that scale of intermittent dose. For this reason, Health Canada's HHRA guidance recommends that "any amortization [for exposures under a remote wildlands scenario] should be applied on a chemical-specific basis with appropriate scientific rationale." [1]	The ET relates to the assumed period in which exposure may occur at a site, not to the period of exposure required to elicit toxicity. This is addressed by the choice of TRV used to set the standard (i.e. acute, sub-chronic or chronic TRVs). In setting the standards, the ministry carefully weights differences in TRVs elicited by acute versus chronic exposure. Where conflict exists between acute and chronic TRVs the more conservative (i.e. stringent) TRV is used.
181	Derivation of standards; will drive them much lower; for (EC)ecological toxicity from 25 to 15th percentile <ul style="list-style-type: none"> <li>What this will look like in practice?</li> </ul>	Lower soil standards could capture more sites as contaminated sites, however the scale of additional capture is dependent on the degree to which sites are currently on the borderline between contaminated and acceptable. MOE intends to consult on the definition and application of the wildlands standard to lands which have had prior Schedule 2 activities.
182	Exposure duration terms  With respect to remote former oil and gas activity sites, the proposed exposure duration term for wildlands sites seems very conservative especially considering the likely use of remote locations in NEBC and long periods frozen ground conditions.	The numerical standard applies province wide and must address reasonable maximal exposure on a similar province wide scale. The ministry acknowledges that exposure duration may differ between cold winter versus temperate rainforest locations in the Province, but believes the proposed exposure duration is a reasonable conservative Province-wide estimate of human soil exposure for wildlands.

<p>183</p>	<p>Wildland vapour standards</p> <p>Currently, oil and gas activity sites do not undergo assessment of soil vapour unless the site is within an area that is zoned for residential, commercial, or industrial use. For a number of reasons including remote locations in NEBC, climate, low utility, low density of nearby inhabitants, former oil and gas activity sites typically present little exposure risk to humans from soil vapours. Creating a new expectation or requirement for soil vapour assessment of all of these sites would be impractical, costly and is unlikely to achieve any significant improvement in the protection of human health.</p>	<p>The ministry has decided to defer development of vapour standards for Wildlands to a future cycle of standards review/updating.</p>
<p>184</p>	<p>As standards are retroactive, the application of revised wildland standards to former oil and gas activity locations will have financial liability implications for the province with respect to legacy sites and orphan sites.</p> <p>Given the proposed derivation methodology for the wildlands environmental toxicity values, it is possible that derived values for some substances may be below typical natural background values. This will increase the number of sites for which site specific background values need to be determined and may cause difficulties in sourcing clean fill that meets background conditions at receiving sites. It is also expected to increase the number of sites requiring site specific risk assessment approaches and decisions. This is likely to have resourcing implications for the Commission.</p> <p>It would seem impractical to require that soil meeting agricultural or residential quality standards be trucked from former remote industrial sites to landfill. From a perspective of effectively regulating oil and gas activities for the benefit of the province, the risks and benefits of various courses of action should be considered. This includes the remedial strategies to be implemented and the level of remediation that can be achieved at specific sites. The implementation of increasingly stringent standards at former oil and gas activity sites would increase both the number of sites requiring remediation and the scope of remedial activities at these sites. The benefits that more stringent standards may provide to populations of organisms that may re-colonize a former oil and gas activity site may be outweighed by the negative environmental impacts.</p> <p>Overall, increased remedial activity at remote former oil and gas activity sites may have negative consequences for the environment and wildlife related to the following:</p> <ul style="list-style-type: none"> <li>• increased disturbance on the landscape related to remedial activities including the opening up of access and installation of stream crossings;</li> <li>• removal of trees and vegetation at the sites requiring remediation and at sites where clean soil is sourced for use as backfill for remedial excavations;</li> <li>• increased trucking of soil from remote sites to landfills and a corresponding increase in vehicular accidents and wildlife mortality as well as an increased carbon footprint associated with remediation; and</li> <li>• increased demand for landfills.</li> </ul>	<p>Level of protection is a MoE policy decision. MoE believes standards must be:</p> <ol style="list-style-type: none"> <li>1. Generally applicable throughout the Province, and</li> <li>2. Appropriately conservative by design</li> </ol> <p>It is important to realize that the standards are based on a generally applicable defined exposure scenario. The standards do not represent site-specific risk assessment. CSST protocol does not address relative ancillary risk (such increased trucking of contaminated soil). The concerns presented relate largely to policy not the scientific defensibility of toxicologically derived environmental quality standards. The issues raised are separate, largely socioeconomic issues for the consideration of the minister.</p> <p>Under the contaminated sites regulatory regime, sites which have received a Certificate of Compliance would normally maintain their status as a "satisfactorily remediated contaminated site" if the CSR standards become more stringent (provided the continued use of the old standard <i>vis a vis</i> the new changed standard would not result in a significant risk to human or ecological health). However, any future contaminated site investigation or remediation conducted for the site would have to meet the CSR standards current at the time of such future investigation or remediation.</p> <p>The ministry will be soliciting comment on a supplemental Omnibus proposal to move to two tier level of environmental protection based wildlands standards. The concept being to develop a WL<sub>Natural</sub> standard targeting an EC15 level of protection and a WL<sub>Reverted</sub> standard targeting an EC25 level of protection. The WL<sub>Natural</sub> standard would apply to natural/pristine wildlands that had never been used for a CSR Schedule 2 Commercial/Industrial use. The WL<sub>Reverted</sub> standard would apply to former Schedule 2 use sites that had been allowed, or were planned to be allowed, to revert to a wildland use. In regard to oil and gas sites, with the exception of spills to natural/pristine wildlands arising from such facilities which would have to be remediated to the WL<sub>Natural</sub> standard, a reverting former oil and gas facility would be expected to be remediated to the WL<sub>Reverted</sub> standard. Note that the soon to be proposed WL<sub>Reverted</sub> standard reflecting an EC25 level of protection would be very similar, or equivalent, to the level of protection currently provided by the use of the parkland standard as a surrogate for a purpose-derived wildlands standard in the CSR.</p>

CSR Omnibus Update: Proposed Amendments to Schedule 6		
No.	Stakeholder Comment	Land Remediation Response
185	Section 2.2 - last paragraph. You may wish to clarify that the level of risk specified is the ILCR (for nonthreshold substances) and include the HQ used by MOE in this paragraph as well.	Agreed, this will be clarified in the protocol paper.
186	4.1 Updates and Additions (Pg. 7, #2-3)  Looks like the default plan is to derive criteria even if those exist in other jurisdictions. Why not proceed the other way round, i.e., incorporate values from other jurisdictions after verifying the derivation methodology, and derive de novo if standards do not exist in other jurisdictions? Also, item 3 states, "If derivation is not possible, adoption of updated standards from other jurisdictions..." Not clear why derivation would not be possible if other jurisdictions could do so. The question is why would we need to derive those values which have already been derived by others?	We have been advised by our solicitor that the suggested approach legally constitutes "adoption by reference". While adoption of some other jurisdictions standards, regulations or statutes (e.g. adoption of elements of the Federal Transport of Dangerous Goods Regulation for use in the Provincial Hazardous Waste Regulation) is possible, it comes with some important caveats (for example adoption by reference of standards means if the originating jurisdiction changes their standards for any reason, the Province's standards are also automatically changed). To date stakeholders have indicated that they would prefer that the CSR standards remain under the control of the ministry, rather than for example simply adopting the generally more stringent CCME Soil Quality Guidelines as CSR soil standards.  In addition, not all jurisdictions derive standards that are consistent with the protection levels of the CSR (e.g., ILCR of 1E-05), and not all jurisdictions use the same parameters in derivations. For example, the US EPA and Health Canada differ in their human-specific values, such as ingestion rates and body weights. Thus, the ministry will perform <i>de novo</i> derivations using toxicological information from reputable sources and human-specific parameters from only Health Canada.
187	Deferring updating of the IW and LW standards is reasonable as the primary drivers at most sites are aquatic life and drinking water uses and capturing new substances for these uses is a higher priority than updating existing IW and LW standards.	We appreciate this comment and support to defer updates to IW and LW standards to a future amendment.
188	Hardness is listed as high priority for both AW and DW standards. Is the intent to establish a range of values? Given the natural variability of this parameter, it would seem likely that a lot of effort would be going into establishing background conditions for water/groundwater at sites located in areas of high or low natural hardness.	Due to time and resource constraints for the Stage 10 amendment, the ministry has decided to defer further consideration of water standards for hardness until such time that the Environmental Sustainability and Strategic Policy Division has developed and approved Water Quality Guidelines for hardness.
189	Deferral of IW and LW to a future amendment This is reasonable as the primary drivers at most sites are aquatic life and drinking water uses and capturing new substances for these uses is a higher priority than updating existing IW and LW standards.	We appreciate this comment and support to defer updates to IW and LW standards to a future amendment.
190	3.2.3. Why is the speciation of metals a low priority given the assessment and remediation of abandoned mine sites is conducted frequently in BC?	The speciation of metals has been given a low priority because this is a large, complex issue for each family of substances and toxicological science is still rapidly expanding. This topic requires significant resources to develop standards and to consult with experts and industry on this topic. Therefore, this issue has been deferred to a future cycle of standards derivation.
191	3.3. Alphabetical Listing of the Compounds: Agree. The current Schedule 10 is in this format.	We appreciate the support for the proposal to list compounds alphabetically.
192	4.1. This is a summary of items that were previously discussed in more detail. Comments in Sections 2 and 3 above address the issues noted.	No response needed.
193	A key concern is that some revised Schedule 6 standards for DW use will be much less than the Canadian DW guidelines. The Health Canada DW group is revered around the world and has a long track history of considering the practical aspects of reaching the DW guidelines (i.e., sometimes the pure math of risk calculations needs to be compared to other sources of information). For some substances, the Health Canada DW group has presented values that do not always result in the targeted risk levels of HQ = 0.1 to 0.2 or ILCR of $1 \times 10^{-5}$ often because there are no practical manner for many	Due to time and resource constraints for the Stage 10 amendment and to avoid possible issues of inconsistency between newly derived CSR DW standards and Health Canada DW guideline based guidelines/standards used by the MoH in regulating municipal water distribution systems and municipal DW quality, the ministry has decided that the derivation of new toxicologically based CSR DW standards for use under the Stage 10 amendment will be limited to only those substances which currently only have aesthetic based Canadian DW guidelines. LRS will however, advise the ministry representative on Health Canada's Federal/Provincial DW

	<p>communities to reach these levels (e.g., trihalomethanes; arsenic). Some US EPA toxicity reference values (TRVs) are outdated and have not considered the most recent literature. As a result, Health Canada, WHO and other agencies may have more appropriate/recent values. It is unclear if any checks will be undertaken to determine if the US EPA TRVs are up-to-date and the most appropriate.</p> <p>Some specific concerns:</p> <ul style="list-style-type: none"> <li>o In the case of arsenic, the DW standard could drop by more than an order of magnitude if only numerical risks are considered</li> <li>o It is unclear if detection limits are considered as part of the approach (i.e., no standard can be lower than a readily available DL?)</li> <li>o For some volatile substances, the Health Canada DW group has shown that inhalation and dermal intake is appreciably greater than ingestion and has utilized the “litre equivalent approach”</li> </ul>	<p>Guideline Advisory Committee of any substances which require urgent development of new, or review/revision of existing, Canadian DW guidelines.</p> <p>The ministry and several CSAP approved professionals will check US EPA TRV values to ensure those TRVs are appropriate and current.</p> <p>The 1996 CSST protocol calls for detection limit adjustment of CSR standards.</p> <p>The ministry agrees that incidental ingestion and inhalation while showering or grooming can be an important route of exposure for some substances. Health Canada, and other major jurisdictions, takes this route of exposure into account when deriving drinking water standards (e.g., vinyl chloride, March 2013). However, based on comment received, the ministry has decided to defer toxicological updating of existing DW standards for substances with Health Canada toxicologically based DW guidelines for the Stage 10 amendment to the Regulation. Thus new toxicologically based DW standards will only be derived for substances with Health Canada aesthetically based DW guidelines for the Stage 10 amendment to the Regulation. However, it is important to note that incidental ingestion and inhalation while showering routes of exposure must still be evaluated, if appropriate, in risk assessment performed for the regulatory purposes of the CSR.</p>
194	<p>A key concern is that some revised Schedule 6 standards for DW use would be much lower than the Canadian DW guidelines. Health Canada’s DW group has a long history of considering practical aspects when deriving the DW guidelines. For some substances, Health Canada has derived values that do not always result in the default targeted risk levels of HQ = 0.1 to 0.2, or ILCR of 1E-05, often because there is no practical manner for many communities to reach these levels (e.g., arsenic).</p>	<p>Due to time and resource constraints for the Stage 10 amendment and to avoid possible issues of inconsistency between newly derived CSR DW standards and Health Canada DW guideline based guidelines/standards used by the MoH in regulating municipal water distribution systems and municipal DW quality, the ministry has decided that the derivation of new toxicologically based CSR DW standards for use under the Stage 10 amendment will be limited to those substances which currently only have aesthetic based Canadian DW guidelines. LRS will however, advise the ministry representative on Health Canada's Federal/Provincial DW Guideline Advisory Committee of any substances which require urgent development of new, or review/revision of existing, Canadian DW guidelines.</p>
195	<p>4.2. Deferred Amendments These items (1-3) seem reasonable to defer to a later amendment phase.</p>	<p>We appreciate the support of the decision to defer these items to a future cycle of updating.</p>
196	<p>Clarification regarding whether Schedule 6 applies to groundwater or surface water would be helpful.</p>	<p>The current Schedule 6 standards are for "water". Unless otherwise indicated in the schedule, no distinction is made for groundwater versus surface water in regard to the Schedule 6 water quality standards.</p>
197	<p>Environment Canada has developed a database of environmental quality guidelines (available on the Government of Canada OPEN DATA website). This tool is a compilation of benchmark values for chemicals in various media from numerous national and international jurisdictions, developed to facilitate the screening and remediation processes for contaminated sites. Could this tool be useful to BCMOE?</p>	<p>We appreciate this comment highlighting this database and we believe this tool is useful for all professionals under taking contaminated sites work.</p>
198	<p>Incidental ingestion:  Is it reasonable to consider incidental ingestion and inhalation while showering or grooming as equivalent to drinking water?</p>	<p>The ministry agrees that incidental ingestion and inhalation while showering or grooming can be an important route of exposure for some substances. Health Canada, and other major jurisdictions, takes this route of exposure into account when deriving drinking water standards (e.g., vinyl chloride, March 2013). However, based on comment received, the ministry has decided to defer toxicological updating of existing DW standards for substances with Health Canada toxicologically based DW guidelines for the Stage 10 amendment to the Regulation. Thus new toxicologically based DW standards will only be derived for substances with Health Canada aesthetically based DW guidelines for the Stage 10 amendment to the Regulation. However, it is important to note that incidental ingestion and inhalation while showering routes of exposure must still be evaluated, if appropriate, in risk assessment performed for the regulatory purposes of the CSR.</p>
199	<p>Scientifically this makes sense. Practically, does this make sense? With limited resources, is this a high priority? Inhalation should only be considered for Schedule 11 substances.</p>	<p>The ministry agrees that incidental ingestion and inhalation while showering or grooming can be an important route of exposure for some substances. Health Canada, and other major jurisdictions, takes this route of exposure into account when deriving drinking water standards (e.g., vinyl chloride, March 2013). However, based on comment received, the ministry has decided to defer toxicological updating of existing DW standards for substances with Health Canada toxicologically based DW guidelines for the Stage 10 amendment to the Regulation. Thus new toxicologically based DW standards will only be derived for substances with Health Canada aesthetically based DW guidelines for the Stage 10 amendment to the Regulation. However, it is important to note that incidental ingestion and inhalation while showering routes of exposure must still be evaluated, if appropriate, in risk assessment performed for the regulatory purposes of the CSR.</p>

200	<p>3.2.2 Emerging Compounds (Table 1)</p> <p>On what basis have some new/emerging compounds been prioritized as high while some others have been prioritized as low?</p>	<p>The primary criterion has been presence and use in commerce or industry of the emerging contaminant in British Columbia (i.e., potential for contaminant to be related to Schedule 2 activities). A secondary criterion is evidence of known environmental issues (e.g. leaching of PFOS from airport fire training areas) related to the emerging contaminant of concern.</p>
201	<p>Section 3.3 Listing Compounds: While a simple alphabetical list of compounds using the International Union of Pure and Applied Chemistry (IUPAC) naming convention and a Chemical Abstract Services (CAS) number would add clarity regarding the identity of substances, maintaining the existing list of substances by chemical class or by compound in the new Schedule W, would be practical.</p>	<p>The issue of naming and listing of substances has been referred to BCEL TAC for advice and recommendations.</p>
202	<p>Clarify Units for Ammonia Standards in Schedule 6. Schedule 6 of the CSR lists standards for ammonia as a function of pH. No units are specified in the CSR for these standards, apart from "ug/L unless otherwise stated". By convention, environmental test results for ammonia are reported in units of "as N", rather than "as NH3" or "as NH4". This convention is used so that test results for different nitrogen species may be easily evaluated in comparison to test results for Total Nitrogen or Total Kjeldahl Nitrogen. BCEL TAC understands that the ammonia standards in Schedule 6 are intended to be in units of "as N". The units of the ammonia standards should be expressly described in the CSR.</p>	<p>Agreed, the water standards for ammonia will be specified "as N".</p>
203	<p>Clarify Salinity Units in Schedule 6. The standard for Salinity in CSR Schedule 6 is listed in units of g/L. The industry standard test units for salinity are "Practical Salinity Units" (psu), which approximate, but are not identical to, the stated units of g/L. BCEL TAC has previously sought clarification of the intent of this standard from MOE, and MOE has indicated that "Practical Salinity Units" are in fact the intended units for the standard. This should be clarified.</p>	<p>This comment has been referred to BCEL TAC for advice and recommendations.</p>
204	<p>Emerging Toxicants - Nanomaterials. MOE has provided several categories of "emerging toxicants of regulatory concern" that are under consideration for addition to the CSR. Published reference methods exist for most of these substances and substance categories, with the notable exception of nanomaterials. Although much research is being conducting in this area, test methods for nanomaterials remain a "leading edge" science, especially for the testing of environmental samples. Test methods that do exist for nanomaterials are much more effective for the qualitative evaluation and study of nanomaterials in commercial products rather than for producing quantitative measures of nanomaterials in environmental matrices. We believe that it would be premature to issue regulatory environmental standards for nanomaterials until widely recognized reference methods become available for their quantification. We note from the Proposed Amendments to Schedule 6 that standards are not proposed for development in the Stage 10 amendments.</p>	<p>Agreed, CSR standards for nanomaterials will not be included in the Stage 10 amendment. Rather, they are cited as a "placeholder" for possible consideration in future updates to the standards.</p>
205	<p>Emerging Toxicants – Alkylated PAHs. We note from the Proposed Amendments that "alkylated PAHs (total)" has been indicated as a high priority new substance for Schedule 6. BCEL TAC agrees that CSR standards for a broader list of PAHs, including alkylated PAHs, would be beneficial, but we would advise against a single standard for "alkylated PAHs (total)". Measurement of alkylated PAHs is complex, and requires determination of numerous alkylated PAH homolog groupings (for example, C1-naphthalenes, C2-naphthalenes, C3-naphthalenes, C4-naphthalenes, etc). The toxicity associated with different homolog groups must certainly vary widely, as is the case with non-substituted PAHs. In order to determine a sum for "alkylated PAHs (total)" in a test sample, labs would first have to measure and quantify each individual homolog group. Therefore, in our opinion, it would be more beneficial to develop toxicologically relevant standards for each defined homolog group or series, rather than focusing solely on the total alkylated PAH value.</p>	<p>Agreed, the intent is to establish water standards for discrete alkylated PAHs if possible within the time and resource constraints of the Stage 10 amendment. The ministry will not set water standards for "total" alkylated PAHs.</p>

206	Fully Define Chlorophenol Standards in Schedule 6. Schedule 6 provides standards for chlorinated phenols, including monochlorophenol, dichlorophenol, trichlorophenol, tetrachlorophenol, and pentachlorophenol. Other than pentachlorophenol, each of these categories is a class that contains three or more discrete isomers. Schedule 6 gives ranges of standards, and states by footnote that “Standard varies with pH, temperature and substance isomer. Consult director for further advice.” BCELTA recommends that these standards be fully defined in the CSR either directly within the new water substance schedule, or through a link to a secondary document.	This ministry has already addressed this issue – see <a href="#">2005 Technical Guidance 9, Chlorophenol Aquatic Life Water Quality Standards</a> .
207	Replace Schedule 6 Standard for Nonchlorinated Phenols (total) with Discrete Phenolic Standards. Please refer to earlier correspondence to BC MOE from BCELTA for details about this recommendation. We note that this has already been proposed in the Proposed Amendments to Schedule 6.	Agreed, the 'nonchlorinated phenols (total)' standard will be replaced with discrete phenolic standards.
208	<p>Define Sulfide (as H<sub>2</sub>S) in Schedule 6. Sulfide (as H<sub>2</sub>S) could be interpreted to mean at least three different things, as follows:</p> <ul style="list-style-type: none"> <li>a) Total Sulfide (as H<sub>2</sub>S); an inexpensive, common, simple lab test (field preservation is required)</li> <li>b) Dissolved Sulfide (as H<sub>2</sub>S); requires a complicated field flocculation procedure, but is used in some circumstances, and can generate substantially lower results from Total Sulfide in some cases</li> <li>c) Hydrogen Sulfide; can be calculated from Dissolved Sulfide, temperature, and ionic strength (a complex calculation that is rarely done)</li> </ul> <p>It is important for the CSR to better define the intended meaning of the Sulfide standard. If Dissolved Sulfide (as H<sub>2</sub>S) is the preferred measurement and is the primary substance of toxic concern, then Total Sulfide (as H<sub>2</sub>S) can be used as an inexpensive, simple screening test (since Total Sulfide is by definition ≥ Dissolved Sulfide). Then, when the standard is potentially exceeded with a Total Sulfide (as H<sub>2</sub>S) measurement, practitioners can proceed to measure Dissolved Sulfide (as H<sub>2</sub>S) to conclusively determine or not whether the standard has been exceeded.</p>	This issue has been referred to BCELTA for advice/recommendation
209	Table A1-1 does not include 1,3,5-trimethylbenzene, which has a current PPRTV chronic oral reference dose (1E-02 mg/kg-day), as well as a current PPRTV chronic RfC on which the Schedule 11 standard was based. Seems inconsistent to treat this substance (and others?) differently.	The ministry will review the information provided and consider adding this substance, if appropriate, during the Stage 10 amendment.
210	In addition to 1,3,5-trimethylbenzene mentioned above, cumene has USEPA TRVs (chronic oral RfD of 1E-01 mg/kg-day, and chronic inhalation RfC of 4E-01 mg/m <sup>3</sup> , both in IRIS). Inclusion of these two substances, and possibly others, in the DW standards update to be consistent with substances such as BETX seems sensible.	The ministry will review the information provided and consider adding this substance, if appropriate, during the Stage 10 amendment.
211	Naphthalene is listed in the second bullet in Section 3.1.2 as an example of a substance with an outdated AW Standard. The 2007 MOE Water Quality Guideline upheld the recommended 1 µg/L chronic surface water value. Is a newer value available?	During Stage 10, it was a goal of the ministry to evaluate the entire family of PAHs; hence, naphthalene was included on the list with related substances.
212	When updating PAH AW standards, will the use of the phototoxic studies be included in the derivation? For groundwater, it is recommended that the phototoxic studies not be included, based on current research.	All material relating to PAH toxicity will be reviewed as a part of the PAH AW standards update. In regard to consideration of PAH phototoxicity in setting the new Schedule W water standard for aquatic life the ministry assumes that as groundwater can “day-light” (i.e. comprise) surface water inhabited by aquatic life, phototoxicity is a valid end-point for setting aquatic life protective water quality standards. Note that the ministry has already established phototoxicity based ambient water quality guidelines for some PAHs (e.g. pyrene).
213	MOE also updated the chronic surface water guidelines for toluene (0.5 µg/L) and xylenes (30 µg/L) in 2007. Are the AW standards for these substances also proposed to be updated?	Yes, water quality guidelines that have been updated or produced by MOE will be included in the Stage 10 amendment.

214	Organo-leptic substances: Agree. It makes sense to base standards on toxicological principles, and not aesthetics.	We appreciate this comment and support to derive DW standards based on toxicological principles and not aesthetics.
215	3.2.2. The sources of Antimicrobials and Estrogen Hormones parameters sources are domestic wastewater and septic fields. Is the intent that if there is a septic field that these parameters would be PCOCs? Are there available remediation methods for groundwater or surface water for these parameters? Is inclusion of these parameters in the CSR the best place for regulating them?	There are additional sources of these substances in Schedule 2 activities (e.g., Section H). Private septic fields are not Schedule 2 activities. There are water treatment technologies and remediation options for these substances. Regulation in the CSR is appropriate for contaminants that are known toxicants, found in BC, and associated with Schedule 2 activities.
216	3.2.2. PFCs as high priority substances: Health Canada's Water Quality Program Division is developing DW standards for PFOS and PFOA over the next year or so (possible release for comment in late 2016). Their current position appears to be that there is only sufficient toxicological information for PFOA and PFOS to conduct a health risk assessment. Does this timing muddy things if MOE releases a DW standard in 2016? In the absence of sufficient toxicological information for individual perfluoroalkyl substances (PFAS) other than PFOA and PFOS, what will be the MOE's approach for developing guidelines for the other PFAS? A TEF approach similar to the existing Health Canada Drinking Water Guidance Values for several PFAS? Adoption of groundwater guidelines from other jurisdictions (e.g. Minnesota, New Jersey)? Note that Table 1 in Section 3.2.2 identifies "related perfluorinated substances (12)", while Appendix 2, Table A2-1 states "14 additional PFCs could be regulated" (i.e., 12 plus PFOA and PFOS).	PFCs are high priority substances but the ministry has decided to defer derivation of a DW standard for PFOA to a future amendment. The ministry has not yet reached a decision regarding inclusion of a DW standard for PFOS in the Stage 10 amendment. Development of draft AW standards for PFOS and PFOA is not yet complete and so the ministry cannot comment at this time as to whether adoption from an American state will occur or not.
217	3.2.2. PFCs as high priority substances: The release of any standards should coincide with formal analytical method development via BCELTA as laboratory methods for these substances have historically been in-house developed methods which can vary between labs (types of sampling containers, types of filters utilized) which have been shown to contribute to interlaboratory variability. Current research suggests that analysis of individual PFAS may significantly underestimate the overall pool of fluorinated precursors at contaminated sites which may degrade to recalcitrant PFAS over time (as demonstrated by techniques such as total oxidizable precursor analysis). Consequently, development of any standards must also be linked to the development of appropriate lab methodologies which will lead to effective management of sites contaminated with these substances.	Agreed, this comment has been referred to BCELTA for advice re: availability/applicability of PFOS analytical method.
218	Appendix 1. An asterisk is denoted for several substances, and the note at the bottom of Table A1-1 states " <i>* This standard was intentionally omitted from Schedule 6 previously and will remain absent in the omnibus update.</i> " This note conflicts with the stated intent of the update to reflect recent science and scientifically defensible approaches. Iron and manganese have water quality guidelines and AW standards could readily be developed. Since VPHw is a mixture of multiple substances with variable human TRVs, and MOE proposes to review the CCCME hydrocarbon fractions approach, omitting development of a DW standard for VPHw seems reasonable at this stage of amendments.	We appreciate the support to defer development of a DW standard for VPHw at this point in time. The ministry notes that in the case that a VPHw standard is urgently needed (e.g. a major spill to a sensitive watercourse) the Director can in dealing with the environmental emergency can adopt a standard or guideline similar to a purpose-derived VPHw standard, from another jurisdiction.
219	Appendix 2. LEPH and VPH are included in the list for DW derivation. How is this derivation going to be completed? With surrogates? With a new methodology that includes the work completed on hydrocarbon fractions? Whatever the methodology, it must be clear and transparent.	Due to time and resource constraints for the Stage 10 amendment, the ministry has decided to defer further consideration of possible adoption of the CCME PHC fraction approach (and possible derivation of standards for any environmental media, reflecting the CCME PHC fraction approach) to the next cycle of standards updating.
220	Appendix 3. Various triethyl, butyl, phenyl (etc) tins are listed to have DW standards derived. What are the sources and is this a priority area in BC for GW or water used for DW to be impacted by these parameters?	As toxicity associated with organotins is primarily an ecological health concern, organotin substances are not a priority for DW standard derivations. The paper will be revised to reflect this information.
221	Table 1 - proposals to include new and emerging compounds (or families of compounds) of environmental concern in CSR aquatic water (AW) standards for contaminated sites including natural and synthetic estrogen hormones (17 $\alpha$ -ethinylestradiol (EE2)), alkylated polycyclic aromatic hydrocarbons (alkylated PAHs), alkylphenols and alcohol ethoxylates (surfactants), and polybrominated diphenyl ethers (PBDEs), etc: A rationale for the perceived MOE consideration of estrogen hormones as a low priority substance group in drinking water would be beneficial. - Is the MOE also considering inclusion of the natural and synthetic estrogen hormones into the soil standards?	The water standards update protocol paper contains additional information relevant to this comment. In short, natural estrogen hormones are not being considered for standards at this point in time.  The Organic Matter Recycling Regulation (OMRR) is a separate regulation and contains schedules based on the Contaminated Sites Regulation. It is our understanding that the current intent is to update OMRR using the new schedules but the commentator should directly contact the section of the ministry responsible for OMRR for current information.

	<p>- Given the nature of these substances, it is likely that they would be present in biosolids, and as such there may be implications associated with land application of biosolids. To avoid classification of historical biosolids application lands as contaminated sites, this would need to be considered in the consequential Organic Matter Recycling Regulation (OMRR) amendment.</p> <p>- A consideration should be given to commercial availability of analytical methods with low enough detection limits for determination of environmentally relevant concentrations of these compounds.</p> <p>- Since some of the compounds are not regulated under BC Water Quality Guidelines (WQG), does the MOE plan to consequentially amend BC WQG?</p>	<p>Analytical methods and detection limits have been considered for new and emerging compounds of concern.</p> <p>BC WQGs are developed by a different section of the ministry and the commentator should directly contact that section for current information.</p>
222	The TRV selection hierarchy proposed for drinking water standards differs slightly from the hierarchy proposed for vapour standards. What is the rationale for this decision and will this lead to inconsistencies across CSR standards? Also, it is unclear what selection hierarchy will be used for soil standards.	Decisions related to TRV hierarchy for the different media largely reflect differences in the verification requirements of the various agencies for the different environmental media. The ministry has refined the hierarchy of sources for human health TRV selection and will provide this information as part of the documentation of the derivation of the approved new/updated standards.
223	It is not clear why BC MOE, as a member of the CCME, has chosen to prioritize the USEPA over CCME as a source in its' hierarchical approach to inform decisions about the availability and/or suitability of new scientific information used to derive or adopt standards from other jurisdictions. (PC)	The current hierarchy of TRV sources listed in Technical Guidance 7, for use in risk assessment at contaminated sites, places the US EPA IRIS at the top of the list. The US EPA toxicity information is based on the more extensive substance database and more frequent review and revision of toxicological data compared to CCME.
224	Similar to that discussed for Schedules 5 and 11, sometimes US EPA toxicity reference values (TRVs) are outdated and not considering the most recent literature. As a result, Health Canada, WHO and other agencies may have more appropriate/recent values in some cases. It is unclear if any checks will be undertaken to determine if the US EPA TRVs are up-to-date and most appropriate	TRVs will be checked to ensure they are the most current and scientifically defensible TRVs available at the time of deriving the new standards. The ministry and an independent party have checked US EPA TRV values for appropriateness and currency, and subsequently followed the hierarchy of TRV sources for standard derivation.
225	The proposed TRV selection hierarchy gives priority to the USEPA over, for example, Health Canada. MOH agrees that the USEPA TRVs may be more current (i.e., more regularly maintained, updated and peer reviewed). MOE should be aware, however, that this may create inconsistencies with human health risk assessments conducted for environmental assessments in BC and federal contaminated sites where Health Canada TRVs and protocols are recommended. As well, MOH is aware of at least two substances (lead and selenium) for which the USEPA TRV may not be relevant or appropriate for the BC context.	This inconsistency between the ministry's and Federal agencies' risk assessment requirements exists today. The ministry is committed to harmonizing risk assessment methodology with our Federal colleagues wherever possible. However, Technical Guidance 7 indicates currently that risk assessors should select US EPA IRIS as the first source of information for TRVs.
226	The proposed hierarchy is a mix of human based sources, and sources for ecological information, with some references including both human and ecological. Since USEPA is the source for both human and ecological information, the hierarchy implies that EPA based aquatic life information will take precedent over BC water quality guidelines, which would be in contradiction to the CSST approach. It may be clearer to have the drinking water and aquatic life hierarchy of sources listed separately. Introduction of the decision to defer updates to IW and LW standards could be above the hierarchy in Section 2.2 rather than in Section 3.1.1. The decision of which reference is selected for each of the substances should be available for review.	Agreed, the single hierarchy in the proposal paper will be split into a hierarchy for human health TRV sources and a hierarchy for aquatic life sources. The ministry is considering providing the identity of each reference (i.e., source) selected for each substance when the draft standards are released during this Stage 10 process.
227	For some COPCs, separate TRVs are available for oral and inhalation exposures. In these cases, the exposures via these pathways should be determined separately for comparison to pathway-specific TRVs. Absorption following ingestion (oral) exposure will be assumed to be 100%, as oral TRVs are based on delivered, not absorbed, dose. Likewise, absorption following inhalation exposure will be assumed to be 100%, as inhalation TRVs are generally based on the measured airborne concentration, not absorbed dose. Few TRVs exist specifically for the dermal exposure pathway. Therefore, dermal exposures will routinely be added to the oral dose, following adjustment for relative bioavailability or absorption, for subsequent comparison to the oral TRV.	Agreed.

228	For COPCs where multiple exposure pathways will be summed for comparison to a single TRV, it will be necessary to apply relative absorption factors (RAFs) in exposure calculations. Oral exposures should always be assumed to have a relative absorption of 100% (RAF <sub>Oral</sub> = 1). Where inhalation exposures are being summed with oral exposures, the inhalation RAF (RAF <sub>Inh</sub> ) will generally default to 1 unless there is good evidence that respiratory absorption is significantly less than 100%. Such evidence must be fully referenced in the event that a RAF <sub>Inh</sub> < 1 is used. Also, published toxicological studies should be reviewed to confirm that using the oral TRV to characterize potential inhalation risks is defensible toxicologically.	Agreed.
229	It is agreed that it makes sense to base DW standards on toxicological principles, and not aesthetics.	We appreciate this comment and support to derive DW standards based on toxicological principles, which is consistent with the original CSST protocol.
230	Section 2.2 references MOE's Interim DW Standards for Aluminum, Iron and Manganese. In the derivation document, an allocation factor (AF) of 0.2 is used for aluminum and iron, while an AF of 0.5 is used for manganese. New Schedule W derivations should be transparent regarding the choice of AFs if a value other than 0.2 (default) is used for a substance.	Agreed, the ministry will provide information on deviations from the standard allocation factor of 0.2, if appropriate for a substance.
231	Use of dissolved WQGs for deriving standards: Please clarify what this means. Does this mean that only dissolved would apply or does this mean there are two standards, one for dissolved and one for total? Is this intended to apply to both organic and inorganic substances (i.e., to all substances)? Presumably this would result in changes to Footnotes 2b, 2c and 2d of the current Schedule 6, taking out any reference to total substance concentrations. If this is the intent, it seems reasonable. Also, is this for both AW and DW?	The intent of this portion of the proposal paper was to highlight that dissolved metal guidelines that are produced by MOE will be used to draft AW standards. It is not likely that the footnotes referred to will change drastically in the Stage 10 amendment.
232	3.2.1. Updating Schedule 10 substances to reflect current USEPA DW standards needs to consider the issue of an allocation factor between different media. Reference 9 (US EPA, 2014) has been updated to June 2015. The derived tap water values are based on a hazard quotient of 1. This may conflict with the CSST rules for deriving standards if the USEPA Tap water RSLs are adopted outright with no allocation factor adjustment. The EPA values are also based on exposure assumptions (e.g., 1 L/day drinking water consumption by a 15 kg child) which differ from the exposure assumptions in Health Canada guidance, which is the recommended source per Technical Guidance 7.	Schedule 10 DW standards will be adjusted (as was done previously in the derivation of toxicologically based DW standards for Al, Fe and Mn for the Stage 7 amendment to the CSR) for TRV apportionment (i.e. default 0.2 for DW) and for carcinogenic substances in Schedule 10 to reflect the CSR ILCR risk-based standard (1E-05).
233	3.2.2. In general agreement with the prioritization of most substances. Hardness is listed as high priority for both AW and DW standards. Is the intent to establish a range of values? Given the natural variability of this parameter, it would seem likely that a lot of effort would be going into establishing background conditions if water/groundwater at sites located in areas of high or low natural hardness. The cadmium and zinc standards developed in Protocol 10 factor in hardness to determine the standard to apply. Beyond this hardness dependent type of relationship, what is the rationale regarding hardness as a stand-alone high priority parameter of concern? The rationale presented in Table A2-2 seems to identify the concern as primarily related to releases to surface water downstream of operating industrial activities where water quality guidelines rather than AW standards would apply.	Due to time and resource constraints for the Stage 10 amendment, the ministry has decided to defer further consideration of water standards for hardness until such time that the Environmental Sustainability and Strategic Policy Division has developed and approved Water Quality Guidelines for hardness.
234	The proposed amendment will retain derivation methods for aquatic life standards including multiplying BC or CCME water quality guidelines by a factor of 10 assuming availability of 1:10 dilution. The information in this schedule could be strengthened/clarified to ensure that the BC CSR schedule 6 standards are not applicable where the 1:10 dilution is not available (e.g. not applicable in the receiving environment). It may be useful to incorporate some to the information from Tech. Guidance 15 directly into Schedule 6 or into other sections of the BC CSR.	The current Schedule 6 footnote relating to the assumption of 1:10 dilution will be incorporated into the new water schedule. The responsibility for ensuring that the conditions under which the standards (e.g. 1:10 dilution) are applicable remain constant is a responsibility of the responsible person(s) for the site. If associated conditions related to the applicability of numerical standards change at a site, the ministry may rescind any instrument (e.g. CoC) issued for the site.

235	Define Requirement for Hardness Calculation (Dissolved vs Total). Several Schedule 6 standards are functions of water hardness. Hardness is normally defined as a function of the concentrations of calcium and magnesium {Hardness, as mg equivalent CaCO <sub>3</sub> /L = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L]}. However, the CSR does not define whether Dissolved or Total concentrations of Calcium and Magnesium should be applied for the calculation of Hardness. BCELTA recommends the use of Dissolved Calcium and Magnesium for the calculation of the most accurate Hardness results. Hardness may be estimated using Total Calcium and Magnesium concentrations, but such results may be biased high in samples that contain solids or precipitates. We note that clarification of hardness has been included in the Proposed Amendments to Schedule 6.	Due to time and resource constraints for the Stage 10 amendment, the ministry has decided to defer further consideration of water standards for hardness until such time that the Environmental Sustainability and Strategic Policy Division has developed and approved Water Quality Guidelines for hardness. The issue of clarifying the analytical definition of "hardness" has been referred to BCELTA for advice/resolution.
236	Section 4.1, Aquatic Life (AL) water use at 10m from the receiving environment:  Given that AL water inorganic standards are for total substance and typical groundwater samples are for dissolved substance, it is suggested that AL-use groundwater results should be consistently compared in either dissolved or total substance format.	Footnote 2(d) of the current Schedule 6 indicates that dissolved substance concentrations should be used for groundwater; thus, this comment is already addressed in the CSR.
237	No detail is provided on the <i>de novo</i> derivation methods that will be used to develop AW standards for new substances.	Documentation of details related to the derivation of the new standards will be provided after the Stage 10 amendment is approved.
238	With respect to Section 3.1.2, from the drinking water user perspective, an alternative approach that would include a separate section for the organoleptic (aesthetic, taste, feel, smell) end points, as long as they are not confused with toxic endpoints, may be beneficial.	The ministry wishes to convert the Health Canada aesthetic DW based standards for Schedule W to toxic based DW standards as required under the 1995 CSST policy decision that all CSR standards should be toxicological based. The ministry suggests that the Canadian DW guidelines be consulted directly for information related to aesthetic based concerns with DW quality.
239	With respect to Appendix 2, Table A2-2, a consideration of background concentrations of these compounds in certain areas of BC would strengthen the proposed approach.	Agreed, background concentrations of these compounds will be considered when the ministry drafts standards, as outlined in the CSST protocol and as existing MOE/CCME water quality guidelines are adjusted for background concentrations.
240	In the footnotes of Schedule 6, drinking water numerical standards are for unfiltered samples obtained at the point of consumption. However the groundwater samples we collect are not at the point of consumption but from the well- how can we manage this inconsistency? Some sort of attenuation factor/dilution factor was suggested to account for the difference between water collected from a groundwater well and a drinking water well.	As a conservative measure in setting generic numerical drinking water use standards, the ministry deems that a groundwater concentration measured in an aquifer is representative of a tap water concentration. Accordingly, application of a dilution factor to a groundwater concentration as part of assessment of drinking water quality is not considered sufficiently protective of human health. In addition, the ministry is not aware of any other jurisdiction that applies a dilution factor to groundwater concentrations in the setting of generic numeric drinking water use standards. However, the ministry may consider this issue in a future cycle of standards updating should a detailed argument and jurisdictional review be provided that supports the use of a dilution factor.
241	In moving to an exclusive toxicological standard for drinking water, has the Ministry applied a potable water upper threshold for contaminants? Is there a potable water standard? If so, how does the abandoning of organoleptic standards affect potability considerations? Is the new drinking water standard approach sufficiently protective of groundwater where remediation of contamination is notoriously difficult? SABCS would observe that the transition to toxicologically based values for Fe and Mn were more predicated by baseline considerations including the transformation of minerals through redox reactions with organic compounds than by the protection of potability. In that context these changes might be considered exceptions in setting drinking water standards rather than a precedent for the new approach.	The CSR DW standards do not address issues of potability. The CSR DW standards only ensure that drinking water that meets the standard can be consumed without adverse toxicological effects.

CSR Omnibus Update: Proposed Amendments to Schedule 7		
No.	Stakeholder Comment	Land Remediation Response
242	Suggests moving soil relocation for municipalities into provincial jurisdiction, specifically into EMA not just the regulations.	This suggestion has been considered in the Contaminated Soils Relocation Agreement (CSRA) intentions paper, which is to be released Fall 2015.
243	Further to discussions on changes to British Columbia's legal regime for soil relocation, Environment Canada and Aboriginal and Northern Development Canada submitted comments earlier this year (January 3rd, 2015) requesting consideration of soil relocation to federal lands. Were these comments considered in the development of proposed amendments?	Issues related to the relocation of contaminated soil to Federal lands is being considered as a part of a broader <i>Environmental Management Act</i> amendment which is unrelated to the Omnibus updating of standards. More general information related to changes to contaminated soil relocation under the Contaminated Sites Regulation will be provided in the upcoming CSRA intentions paper planned for release in the Fall 2015. For more information on the planned CSRA intentions paper please contact Kerri Skelly ( <a href="mailto:Kerri.Skelly@gov.bc.ca">Kerri.Skelly@gov.bc.ca</a> ).
244	Are the proposed updates limited to abandoning Schedule 7 standards and instead using the new Schedule X standards? It is not clear how this will be implemented: Does this mean that if soil exceeds applicable standards at the receiving sites it cannot be deposited, or does it mean if standards are exceeded a soil relocation agreement is needed?	This question will be answered fully in the CSRA intentions paper, which is to be posted Fall 2015. Please contact Kerri Skelly ( <a href="mailto:Kerri.Skelly@gov.bc.ca">Kerri.Skelly@gov.bc.ca</a> ) for further details.
245	Our society notes that the new approach will be based on standards of the soil being relocated that are applicable to the site. Does this refer to both agricultural and non-agricultural receiving lands? Has the Ministry considered the total and hence cumulative impacts of contaminants stored in landfills at the industrial standard? Our society notes that the complex chemistry and changes in mobility of contaminants within municipal and commercial landfills is still a matter of study. The Ministry refers to abandoned mines and gravel pits. Presumably, these are not sealed sites and estimation of the potential for runoff may be a concern. Consequently, the continued involvement of MoE in landfills where soil relocation occurs is considered prudent	It will refer to both agricultural and non-agricultural land. We are considering the effects of large quantities of soil that meet the applicable land use standard stored in limited spaces and the effects of the soil on the environment. Details will be provided in the CSRA intentions paper. Please contact Kerri Skelly ( <a href="mailto:Kerri.Skelly@gov.bc.ca">Kerri.Skelly@gov.bc.ca</a> ) for further details.
246	While provision for a review of leachate tests was proposed in the policy paper on the groundwater model (GPM), our society observes that further refinement of leachate tests will continue to occur and that current science should be revisited during the next five year cycle.	Information relating to leachate testing will be released in the update to Protocol 2, expected mid-2016. In addition, the ministry has recently initiated work on a new CSR protocol related to the use of a TBD specific leachate test for use in authorizing the relocation of large volumes of contaminated soil.

CSR Omnibus Update: Proposed Amendments to Schedule 9		
No.	Stakeholder Comment	Land Remediation Response
247	Page 4, 2nd Paragraph: Our agency is still in the process of finalizing guidance on Direct Contact at sediment sites, and it will be published as 'supplemental guidance'. Due to the variability of exposure scenarios that are expected to be encountered at sediment sites, our agency will not be publishing numerical sediment quality guidelines for the protection of human health which is alluded to in the text included in this paragraph. Instead, our agency is in the process of developing guidance on how to derive site-specific screening values for use on federal contaminated sites. At this time, the guidance on the derivation of site-specific screening values is very preliminary in nature and evolving at this time.	Noted. This has been rephrased in the discussion paper.
248	Our agency supports the decision to hold on the development of sediment quality standards to protect human health while Health Canada is working on sediment guidelines for the direct contact pathway. Our agency agrees with MOE's recommendation that risk assessors continue to use health-based soil standards to screen substances as COPCs in detailed HHRA of contaminated sediment sites, but for the <i>direct contact exposure pathway only</i> . This practice is strongly discouraged for screening COPCs in HHRAs for indirect sediment exposure pathways, such as human consumption of aquatic biota, since it does not account for the potential for substances to bioaccumulate and biomagnify between trophic levels. Furthermore, use of soil standards for sediment may not apply where surface water is used as a drinking water supply. Our agency has seen misapplication of this approach attempted for HHRAs in EAs and recommends that MOE emphasize this distinction in the proposed guidance.	Agreed, it is intended that the use of soil standards as surrogate human health protective sediment standards will be eliminated in a future amendment to the standards once Health Canada approves and issues human health protective sediment standards.
249	Experience from FCSAP aquatic sites portfolio has shown that organotins (e.g. tributyl tin, TBT) in sediment is a fairly prevalent contaminant of concern (COC) and the lack of guidelines for these parameters has sometimes hampered site assessment and management. We therefore suggest that effort be spent on the derivation and/or adoption of sediment (or perhaps interstitial water) standards for organotins in order to create a more certain regulatory environment for the site assessment/management practitioners.	Due to time and resource constraints associated with the Stage 10 amendment, the issue of developing sediment quality standards for organotins must be deferred to a future cycle of standards updating. The ministry notes that In the case that organotin sediment standards were urgently needed (e.g. a major spill to a sensitive watercourse) the Director can in dealing with the environmental emergency can adopt organotin sediment standards or guidelines from another jurisdiction.
250	Our society notes that the McDonald method has been confirmed in the conversion of guidance into sediment standards. Has the Ministry undertaken to review developments in other jurisdictions on an on-going basis?	Yes, please see Appendix A of the proposal paper for a current jurisdictional review of sediment quality standards.
251	Remove Total PAH in Sediment Criteria. BCELTA recommends removal of the "Total PAH" criteria from the Criteria for Managing Contaminated Sediments in BC. Criteria for "Total PAH" are not toxicity based, and do not add value to the existing PAH criteria. In fact it is impossible to exceed the criteria for "Total PAH" without also exceeding at least one of the individual criteria listed for 13 discrete PAHs. Although the "Total PAH" parameter is defined within the criteria document, there exists substantial potential for error and confusion in the definition and use of this parameter.	Agreed. This is a priority item for a future cycle of revisions. The Ministry intends to repeal the summed PAH standard and include more discrete PAH sediment standards when possible.
252	The rationale presented for converting the sediment quality criteria to standards with no changes at this time seems reasonable.	Noted.
253	Freshwater criteria appear to be based on chronic sublethal data while marine criteria appear to be based on acute lethal data. How is the absence or paucity of sublethal data accounted for in marine criteria?	This difference between freshwater and marine is a result of the lack of marine chronic data available at the time of setting the Schedule 9 criteria. If sufficient chronic data is available at the time of reviewing the marine sediment standards (i.e. the next cycle of standards updating) it will be used in setting new marine sediment standards.
254	How do the criteria account for the absence or paucity of toxicity data for species other than amphipods?	Amphipods are commonly used in sediment standard derivation because of their sensitivity to contamination, and the availability of a standardized laboratory toxicity testing method. It is generally assumed that a standard set in this manner would be protective of larger organisms with lower sensitivity, a less close association with the sediment, and/or larger home ranges.

255	How does the “probability” basis of the criteria (e.g., SQCTS = 50% probability of observing an EC20) relate to protection goals and allowable effects levels in risk assessment?	<p>The Tier 1 ecological risk assessment guidance (1998) established a risk assessment aquatic life protection goal of 20%, without reference to probability. The Criteria for Managing Contaminated Sediment in British Columbia, Technical Appendix (2003) describes the protection goal of the sediment criteria and site-specific sediment criteria:</p> <p>" Risk-based SedQs can be established at risk levels that are less than or equal to those upon which the sediment quality criteria are based (i.e., a 20% probability of an EC20 or greater for sensitive sites and a 50% probability of an EC20 or greater for typical sites)."</p> <ul style="list-style-type: none"> <li>- <a href="#">Criteria for Contaminated Sites: Criteria for Managing Contaminated Sediment in British Columbia</a></li> </ul> <p>A companion document provides guidance on interpreting toxicity tests performed in the context of risk assessment, and it recommends: “Sediments that are found to be significantly toxic relative to control and reference sediments should be considered to be problematic.”</p> <ul style="list-style-type: none"> <li>- <a href="#">Guidance Manual to Support the Assessment of Contaminated Sediments in Freshwater, Estuarine, and Marine Ecosystems V. 3</a></li> </ul> <p>The interpretation of sediment risk assessment lines of evidence should be consistent with the EC20 level of protection for aquatic life. The problem formulation should identify the sediment category (typical or sensitive) and if sensitive, discuss how the additional sensitivity will be accommodated in the risk characterization.</p>
256	Also, consider prioritizing the derivation of standards for relatively common substances currently without standards but for which there is an expectation of remediation (e.g., TBT).	This will be considered in a future amendment to the standards.
<b>Human Health Protection</b>		
257	Some may interpret that the approach for Schedule 9 standards would support that if a site does not exceed soil intake standards in sediments that no further HHRA is required; however, past experience with the MOE indicates that there can remain a concern. The approach effectively assumes that sediment ingestion rates will not be greater than soil ingestion rates. There is some evidence to support this approach at the vast majority of sites where people spend less than 7 or 8 hours per week in direct contact with sediment	The numerical standards are based on defined exposure scenarios which may or may not adequately address all exposure pathways which may be determined to be operational at a specific site undergoing risk assessment. Exposure pathway assessment under site-specific risk assessment is typically much more extensive and sophisticated than the more general defined exposure scenarios used to establish numerical standards.

CSR Omnibus Update: Proposed Amendments to Schedule 10		
No.	Stakeholder Comment	Land Remediation Response
258	Page 1, Summary, Bullet 2. "...current United States Environmental Protection Act Agency (USEPA)..." Agency should be Act	This typographical error will be corrected - Act will be removed.
259	Given that the US Environmental Protection Agency (US EPA) Regional Screening Levels are targeted for human health protection, it may not be applicable to move any of these values into Part 2 (ecological health) of the proposed new Schedule "X", as proposed in the page 2 of the discussion paper.	The ministry proposes to move DW standards in Schedule 10 into the new water schedule (Schedule W) and the soil standards in Schedule 10 into the new soil schedule (Schedule X). This will consolidate current schedules with mixed media represented into one schedule for each medium (i.e., soil or water).
260	The Ministry refers to the continued use of values from EPA regions 3, 6, and 9 based on the historical approach of MoE to Schedule 10. Are different values available from other regions of EPA or other sources (EU, Australia) that differ in stringency? Will the Ministry be releasing for public comment substances that are to be eliminated when Schedule 10 is transferred to Schedule X?	Due to time constraints the ministry proposes to only updated the Schedule 10 standards (which are solely based on US EPA Region 3/6/9 values) for current US EPA Region 3/6/9 values for the Stage 10 amendment. Similarly due to time constraints, the ministry does not intend to prepare and provide lists of "deleted, modified or otherwise altered" standards.
261	Our society notes that some substances that are being delayed in their inclusion until the 2020 revision may prove to be of significant concern prior to that date. Is the Ministry considering a review of analytical methods and human health impacts of the deferred substances so that action can be taken on them by Director's order in the intervening five years? In particular, our society notes that information on Hg is expected to become available shortly. Our society supports regulation and monitoring of this heavy metal toxin as soon as such information is available.	The Stage 10 Amendment to the Regulation cannot alter or amend the Director's authority under EMA section 60 (c) which deals with the Director's authority and powers to take action if the presence of a contaminating substance at a site poses a threat to human or ecological health, or EMA 63.1 which establishes the Director's authority to establish Interim Standards.
262	In considering removal of substances currently in Schedule 10, our society suggests that the lack of common occurrence may not cover cases where low k sinks still have the potential for such substances to appear in groundwater over prolonged periods.	Agree. Removal of substances from Schedule 10 is only proposed where such substances have been removed from the source reference (US EPA Regional Screening Levels) or where a substance would be duplicated on consolidation of Schedules 4, 5 and 10. Note that the reference to "occurrence" in the Schedule 10 discussion paper was more so to differentiate between those substances more commonly encountered at contaminated sites and included in Schedules 4 and 5 versus those substances less commonly encountered and included in Schedule 10.
263	The proposed amendment does not specify how the newly added land uses (RL <sub>hdr</sub> and WL) will be considered for Schedule 10 contaminants.	Schedule X Part 2 (Generic Human Health Soil standards) will incorporate new generic RL <sub>HDR</sub> and WL standards. The net effect of the different receptor exposure assumptions used to derive RL <sub>HDR</sub> matrix soil ingestion standards is to produce a RL <sub>HDR</sub> standard which equals 2x the corresponding RL <sub>LDR</sub> standard for the substance. Consequently, generic RL <sub>HDR</sub> Human Health protective soil standards for Schedule 10 substances moved to Schedule X Part 2 will be set to 2x the corresponding current Schedule 10 RL standard. In the case of WL, the net effect of the different receptor exposure assumptions used to derive WL matrix soil ingestion standards is to produce a standard equal to the PL standard. Therefore, the Schedule X generic human health WL standard will be set to equal the corresponding current Schedule 10 PL standard.
264	Currently Schedule 10 provides soil and drinking water standards for a number of contaminants not commonly found on contaminated sites. It is proposed that the soil standards are integrated into schedule X. Will the drinking water standards also be incorporated into Schedule W?	Yes, Schedule 10 DW standards will be moved to the new water schedule (Schedule W).

CSR Omnibus Update: Proposed Amendments to Schedule 11		
No.	Stakeholder Comment	Land Remediation Response
265	A commercial exposure term is not practical in the parkade because it is illegal to be working on your car in the underground parkade. Consider flexibility and justification in the exposure times in parkades particularly if no laundry, storage, or people working in their cars spend time in the parkade.	Proposal is for the use of the industrial land exposure term for parkade exposures. The flexibility is already present in the form of application of risk based standards at a site.
266	No current requirement for VQ standards; except for those on zoned areas for commercial, industrial, residential	There is no current requirement for VQ standards for wildlands land use. The proposal for inclusion of wildland standards for vapour is consistent with the introduction of wildlands standards in soil. However, the ministry has decided to defer development of vapour standards for Wildlands to a future cycle of standards review/updating.
267	New standards would require all Wildland sites to have VQ assessment <ul style="list-style-type: none"> <li>• Vapor assessment will be significant cost</li> <li>• Is such a rule commensurate with actual risk?</li> <li>• Exposure scenarios are not realistic</li> <li>• Practicality and cost for assessing sites would be another big challenge</li> </ul>	
268	Access time: in order to do vapor monitoring for winter access sites, it would involve large costs and time	The ministry has decided to defer development of vapour standards for Wildlands to a future cycle of standards review/updating.
269	Parkade Exposures Conservative, even when considering parking, using storage lockers, laundry rooms in a garage (uncommon), vehicle maintenance (not often permitted by buildings). Especially conservative for weekends (i.e. 8 hrs/day). A parking lot attendant should not be considered. Exposure to vehicle exhaust would be a higher concern, and such would be a consideration for WorkSafe, not MoE.	We agree it is conservative, and therefore appropriate for numerical assessment. Vehicle maintenance is not always prohibited. A Parking lot attendant was not considered (please see derivation). Application of the standard would be for substances prescribed in Schedule 11 (not vehicle exhaust).
270	Section 3.2 – the reference to USEPA regulating carcinogens to 1x10-6 incremental lifetime cancer risk is not quite correct in that official policy is to prescribe a risk range somewhere between 10-4 and 10-6 cancer risk.	Noted.
271	Section 5.2 – Use of IL standard for garage receptor seems reasonable	Support for proposed use noted.
272	Section 5.3 – Wildlands exposure scenario: the assumed exposure term for human receptors at wildlands sites is relatively conservative, particularly in light of the fact that amortization of 6 month exposure over a year is likely not appropriate for non-carcinogens (i.e. it would be equivalent to full time residential exposure). The last sentence of section 5.3 is incorrect in that, if the exposure term were 0.5, the standard would be increased by a factor of 2 (not reduced).	Agreed, this is a typo that will be addressed.
273	Section 6.1 – Recommend that vapour COPC selection be carefully considered. Reference to USEPA guidance should recognize that in some cases a conservative approach is followed for COPC selection, for example the 2015 OSWER VI guidance bases selection of COPCs on direct comparison of theoretical estimates of vapour concentrations from Henry's Law constant and/or vapour pressure to risk-based air concentrations without consideration of attenuation.	COPC selection for the majority of sites (service stations and drycleaners) should occur as per the CSAP Soil Vapour Advice and Practice Guidelines. For other sites, following the PSI, substances included in Schedule 11 must be evaluated for vapour contamination.

274	Our society notes that the changes include a derivation for parkades in the RLHDR land class. The approach is supported by our society as contained in the Golder 2011 report on high density urban residential. MoE also cites the SABCS white paper on the same subject.	No response necessary.
275	<ul style="list-style-type: none"> <li>• Vapour standards to be revised using updated models and threshold values</li> <li>• Vapour standards to be created for Wildland standards</li> </ul> <p>The MoE is considering adopting or deriving soil standards protective of wildlands land use. The standards would be intended to be protective of human receptors using wildlands with greater frequency than the average British Columbian (e.g., First Nations, recreational camp users). As part of the Schedule 5 human health standards update, the ministry has proposed an exposure term (ET) for Wildlands of WL ET=24hr/24hr x 7d/7d x 26wk/52wk x 80yr/80yr). This would have the effect of reducing the Schedule 11 AL/PL/RL vapour standard by a factor of 2 for use as the new WL standard.</p> <p>Our company comments: The definition for ET scenario above conflicts with the definitions in the CSR for residential land use – RL standards apply to temporary or seasonal basis including cabins. As such, a seasonal wildland camp would be considered located on Residential Lands and RL standards would apply, not Wildlands. Given this, perhaps the ET should be revised to reduce the number of hours per day that someone would be present on wildland lands. This would directly affect the standards. Or amend the definition of residential and wildland. The propose ET may be too conservative for human health protection.</p>	<p>This is a typo that will be addressed; standards will increase by a factor of 2, not decrease. As a result, Wildlands land use standards would not be more conservative than Residential land use standards for human health.</p> <p>After internal and external consultation the Ministry has decided to defer calculation of wildlands standards to future updates of schedule 11. However, based on internal and external consultation, the Ministry has decided to defer calculation of wildlands vapor standards to future updates of schedule 11.</p>
<b>Human Health Protection</b>		
276	As proposed for Wildlands use, we are unsure that multiplying by 26 weeks/52 weeks is justifiable for non-carcinogens (particularly for substances that are developmental toxicants)	After internal and external consultation the Ministry has decided to defer calculation of wildlands vapor standards to future updates of schedule 11.
277	One of the key aspects to addressing vapours for Wildlands use is that it would seem that no buildings would need to be assumed to be present and, thus, outdoor air attenuation factors could be used. If this is a correct interpretation, it may be important to note this aspect	
278	Similar to that discussed for Schedules 5 and 6, sometimes US EPA toxicity reference values (TRVs) are outdated and not considering the most recent literature. As a result, Health Canada, WHO and other agencies may have more appropriate/recent values in some cases. It is unclear if any checks will be undertaken to determine if the US EPA TRVs are up-to-date and most appropriate	The Ministry and several approved professionals will check that the most appropriate TRVs are selected, based on the hierarchy described in the protocol papers. However, the ministry reserves the right to ultimately decide which TRV will be used to derive or update the standards.
279	It remains unclear how trench vapours will be addressed. This document may be a good place to provide some guidance on MOE expectations for trench vapours	The Ministry has clarified that WorkSafe BC is the primary agency responsible for the regulation of trench worker health and safety. See the CS e-link from 2015-09-30.
280	In the last sentence of Section 5.3, we think it was meant to say that the standards would increase by a factor of 2 (not decrease)	Agreed, this is a typo that will be addressed.