

# **CSR OMNIBUS UPDATING: Protocol Summary - Amendments to Schedule 4 and 5 Human Health Protection Soil Standards**

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## **Protocol Summary**

1. Repeal CSR Schedules 4 and 5 and move existing prescribed substances into a new single schedule (Schedule X) of consolidated soil standards.
2. Dependent on available toxicological data, develop human health soil standards for existing prescribed substances for either:
  - a. Schedule X Part 1 Matrix Soil Standards
  - b. Schedule X Part 2 Human Health Generic Numerical Soil Standards
3. Develop human health soil standards for newly defined land uses, namely Wildlands (WL), Residential Low Density (RL<sub>LDR</sub>) and Residential High Density (RL<sub>HDR</sub>) land uses.
4. Use modified CSST derivation equations which incorporate new exposure assumptions and updated Toxicological Reference Values (TRVs).
5. For carcinogenic substances, establish the final human health soil standard using the more stringent of either the carcinogenic or the non-carcinogenic toxic end-point based standards for each land use.

## **Associated Omnibus Updating Documents**

Details related to proposed changes to CSR Schedules 4 and 5 Human Health Protection Soil Standards are available in the ministry's 2015 Omnibus Draft Discussion Documents:

- [CSR OMNIBUS UPDATE: Proposed Amendments to Schedule 4](#) [1]
- [CSR OMNIBUS UPDATE: Proposed Amendments to Schedule 5 Human Health Protection Standards](#) [2]
- [CSR OMNIBUS STANDARDS UPDATING SUPPLEMENTAL CONSULTATION DOCUMENT: Proposal to Change CSST Protocol in Respect to the Derivation of Human Health Standards for Carcinogenic Substances](#) [3]

Details related to the Ministry's response/decisions on stakeholder comment received on the proposed Omnibus changes to CSR Schedules 4 and 5 are available in:

- [Omnibus Updating of CSR Standards Draft Discussion Documents – Land Remediation Response to Stakeholder Comment](#) [4]

Omnibus proposed changes to, and protocol summaries for, CSR Schedule 5 Soil-to-Groundwater pathway matrix soil standards and CSR Schedule 10 generic soil standards are provided in separate CSR Omnibus Update papers.

## **Protocol Details Related to Human Health Protection Soil Standards for the CSR Stage 10 Amendment**

CSR soil standards are derived using the protocol described in *Overview of Contaminated Sites Soil Task Group (CSST) Procedures for the Derivation of Soil Quality Matrix Standards for Contaminated Sites* (British Columbia, 1996; [5]) with minor modifications.

### Schedule X

CSR Schedules 4 and 5 would be repealed and substances moved into a new single schedule of consolidated soil standards further referred to as “Schedule X”. Schedule X will consist of three parts:

- Part 1 Matrix Soil Standards
  - Part 2 Human Health Generic Numerical Soil Standards
  - Part 3 Environmental Protection Generic Numerical Soil Standards (*as discussed elsewhere*)
1. Former Schedule 5 matrix standards will be updated as required and will appear in Schedule X, Part 1.
  2. Substances formerly appearing in Schedule 4 will be treated as follows:
    - a. Where sufficient toxicological data is available, a Human Health Protection – Intake of Contaminated Soil standard will be calculated.
      - i. Where sufficient collaborative data is available, a matrix will be developed and the substance will appear in Schedule X Part 1
      - ii. Where insufficient collaborative data is available, the substance will appear in Schedule X Part 2
    - b. Where insufficient toxicological data is available, the former Schedule 4 Generic Numerical Soil Standard will be adopted in Schedule X Part 2.
  3. Emerging substances for which the establishment of soil standards was considered appropriate (*as discussed elsewhere*) were added to either Schedule X Part 1 or Part 2.

### Land Uses

Schedule X Part 1 and Part 2 include standards for the following land uses: Wildlands (WL), Agricultural (AL), Low Density Residential (RL<sub>LDR</sub>), High Density Residential (RL<sub>HDR</sub>), Urban Park (UP), Commercial (CL) and Industrial (IL).

The new land uses are defined as follows:

Wildlands      *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 (CSR section 1).

Residential<sub>HDR</sub>      *Use of the land for a residential complex housing multiple persons or families in a multiple unit dwelling comprising three or more above ground stories or floors, including, without limitation:*

- a. an apartment, flat, boarding house, tenement, condominium, dormitory, barracks, commune, lodge, studio, loft, suite,*
- b. an institutional facility, including a boarding school, military academy, hospital, hospice, nursing home, retirement home, monastery, prison, correctional centre, or community centre.*

For more information see [6] and [7].

Exposure Assumptions

Schedule X standards for all land uses are developed using modified CSST derivation equations which incorporate the Exposure Duration Terms below.

Table 1. Exposure Duration Terms (ETs) for use in Modified CSST Derivation Methodology

<b>CSR Land Use</b>	<b>Modified Exposure Duration Term (ET)<sup>1</sup></b>
WL <sup>2</sup>	ET = (24hr/24hr x 7d/7d x 26wk/52wkx x80yr/80yr)
AL	ET = (24hr/24hr x 7d/7d x 52wk/52wkx 80yr/80yr)
UP	ET = (12hr/24hr x 7d/7d x 52wk/52wkx 80yr/80yr)
RL <sub>LDR</sub>	ET = (24hr/24hr x 7d/7d x 52wk/52wkx 80yr/80yr)
RL <sub>HDR</sub>	ET = (24hr/24hr x 7d/7d x 52wk/52wkx 80yr/80yr)
CL	ET = (12hr/24hr x 5d/7d x 48wk/52wkx 80yr/80yr)
IL	ET = ( 8hr/24hr x 5d/7d x 48wk/52wkx 35yr/80yr)

<sup>1</sup> ETs applies to both non-carcinogenic and carcinogenic substances

<sup>2</sup> Subsistence users should be evaluated in detailed human health risk assessment using site-specific values

Other exposure assumptions that were modified included:

- Adjustment of body weight for toddlers (13 to 16.5 kg) and for adults (70 to 70.7 kg), consistent with Health Canada 2012 [8], and
- Adjustment of the soil ingestion rate under commercial land use (80 to 40 mg/day) and establishment of a soil ingestion rate for high-density residential land use (40 mg/day).

Toxicity Reference Values

For CSR soil standards derivation TRVs were selected using the following hierarchy:

1. As defined under the Ministry's [Technical Guidance 7](#): [9] US EPA IRIS will be used, with the exception of the substances: Chlorinated dioxins and furans, PCBs, lead, and methyl mercury, for which Health Canada TRVs will be used,
2. Health Canada,
3. World Health Organization,
4. Any of the following: (in no particular order of preference)
  - a. ATSDR,
  - b. ORNL (RAIS),
  - c. RIVM,
  - d. California EPA,
  - e. US EPA RSLs/PRGs,
  - f. other Canadian Provinces or US State Agencies.

The ministry reserves the right to substitute or derive TRVs in preference to any of the sources identified in this hierarchy.

#### Procedures for the Derivation of Standards for Carcinogenic Substances

In recognition that a non-threshold (carcinogenic) substance may elicit both non-carcinogenic and carcinogenic toxic effects, the ministry modified the 1996 CSST Protocol [5] as follows:

1. Determine if a substance is a threshold or non-threshold contaminant in accordance with the CSST Protocol definition of "carcinogenic substance".
2. Where appropriate TRVs are available for a non-threshold substance, calculate both threshold (non-carcinogenic) and non-threshold (carcinogenic) toxic endpoint-based standards for the substance and various land uses.
3. For each land use, adopt as the new final CSR standard for the substance, the most stringent of the threshold or non-threshold standards, as the CSR Schedule X standard.

Standards for regulated class 2B PAHs, that are not considered "carcinogens" under the CSR definition but for which no RfD was available, were derived using benzo(a)pyrene Toxic Equivalency Factors (TEFs).

#### Clinical Adjustment Factors

As recommended by the Ministry of Health, Clinical Adjustment Factors were no longer used in the CSST equations used to derive new soil matrix soil standards to protect human health for arsenic, cadmium and lead.

## Porting Rules

For substances for which no new standard can be developed using the CSST derivation protocol, former Schedule 4 Generic Numerical Soil Standards were modified as follows to generate standards for all land uses:

Table 2. Porting Rules Applied to Former Schedule 4 Standards

<b>CSR Land Use</b>	<b>Standard in Schedule X</b>
WL	Equal to the Schedule 4 Generic Numerical Soil Standard for PL
AL	<i>(Existing Standard)</i>
UP	<i>(Existing Standard)</i>
RL <sub>LDR</sub>	Equal to the Schedule 4 Generic Numerical Soil Standard for AL
RL <sub>HDR</sub>	Equal to the Schedule 4 Generic Numerical Soil Standard for PL
CL	<i>(Existing Standard)</i>
IL	<i>(Existing Standard)</i>

## Consequential Changes to Protocols

Schedule X soil standards to be established under the Stage 10 amendment to the CSR will be used to revise [Protocol 11 Upper Cap Concentrations for Substances Listed in the Contaminated Sites Regulation](#) [10]. The revised Protocol 11 will be implemented concurrent with the Stage 10 amendment to the CSR.

## **Next Cycle Revisions**

1. As a component of a future next cycle review for updating the Regulation's soil standards to protect human health, consider additional SABCS recommended changes [11], which although supported by the ministry, were deferred to future review due to time and resource constraints.
2. As a further component of a future next cycle review of the Regulation's soil standards to protect human health, consider changes to the exposure terms assumptions for each land use, as suggested by stakeholders.
3. As a further component of a future next cycle review of the Regulation's soil standards to protect human health, consider the following options to revise human health soil standards:
  - a. Repeal or substantively revise the qualitative soil standards for nonaqueous phase liquids and odorous substances, and
  - b. Repeal the existing petroleum hydrocarbon soil standards for VPHs, LEPHs and HEPHs and either:

- i. adopt the current CCME Canada-Wide Standards for Petroleum Hydrocarbons in soil [12] as CSR petroleum hydrocarbons soil standards, or
- ii. develop *de novo*, toxicological risk-based CSR petroleum hydrocarbon soil standards derived in accordance with the modified CSST protocol, as described above in this document.

## References

- [1] British Columbia. (2015). [CSR OMNIBUS UPDATING: Proposed Amendments to Schedule 4.](#) Ministry of Environment. June, 2015.
- [2] British Columbia. (2015). [CSR OMNIBUS UPDATING: Proposed Amendments to Schedule 5 Human Health Protection Standards.](#) Ministry of Environment. June, 2015.
- [3] British Columbia. (2015). [CSR OMNIBUS UPDATING SUPPLEMENTAL CONSULTATION DOCUMENT: Proposal to Change CSST Protocol in Respect to the Derivation of Human Health Standards for Carcinogenic Substances.](#) Ministry of Environment. December, 2015
- [4] British Columbia. (2015). [Omnibus Updating of CSR Standards Draft Discussion Documents – Land Remediation Response to Stakeholder Comment.](#) Ministry of Environment. November, 2015
- [5] British Columbia. (1996). [Overview of Contaminated Sites Soil Task Group \(CSST\) Procedures for the Derivation of Soil Quality Matrix Standards for Contaminated Sites.](#) Ministry of Environment. Victoria, British Columbia. January 31, 1996.
- [6] British Columbia. (2015). [CSR Omnibus Updating: Proposed Amendments to Schedule 5 Environmental Protection Standards.](#) Ministry of Environment. June 2015.
- [7] British Columbia. (2015). [CSR Omnibus Updating: Proposed High Density Residential Soil Standards.](#) Ministry of Environment. June 2015.
- [8] Health Canada. (2012). [Federal Contaminated Sites Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment \(PQRA\), Version 2.0.](#) ISBN: 978-1-100-17671-0. Health Canada, Ottawa, Ont. 2012.
- [9] British Columbia. (2015). [Technical Guidance 7: Supplemental Guidance for Risk Assessments.](#) Ministry of Environment. November 2015.

- [10] British Columbia. (2014). [Protocol 11: Upper Cap Concentrations for Substances Listed in the Contaminated Sites Regulation.](#) Ministry of Environment. February 2014.
- [11] SABCS. (2009). [Report on: Review of CSST \(1996\) Soil Matrix Derivation Approach and Related Policy Decisions. Volume II: SABCS Review and Recommendations for Revision of the Soil Quality Matrix Standards for Contaminated Sites.](#) A Report Submitted to the B.C. Ministry of Environment. Prepared by: Science Advisory Board for Contaminated Sites in British Columbia (SABCS), Victoria, British Columbia, November, 2009.
- [12] CCME. (2008). [Canada-Wide Standards for Petroleum Hydrocarbons \(PHC\) in Soil.](#) Canadian Council of Ministers of the Environment. Winnipeg, Manitoba. 2008.