

CANADA-WIDE STANDARD FOR PETROLEUM HYDROCARBONS IN SOIL 2008 REPORT

Implementation Summary

Since the endorsement of the Canada-wide Standard for Petroleum Hydrocarbons in Soil (PHC CWS) in 2001, a concerted effort to have more consistency in the approach to petroleum hydrocarbon impacted site assessment has occurred across Canada. Implementation of PHC CWS has been adopted in some jurisdictions, (Alberta, Saskatchewan, Manitoba, Northwest Territories and Ontario) while the Atlantic Provinces continue to use Atlantic RBCA on the basis that it is considered an equivalent approach. Yukon and Nunavut are still reviewing and hope to adopt PHC CWS, British Columbia is considering possible adoption and although Quebec did not sign the Accord, they continue to review the science and participate on the committee. Having participated in its development, industry is complying with the standard. All Canadian jurisdictions have either implemented the PHC CWS, or an equivalent approach, which has resulted in changes to regulations, guidelines or policy. In 2008, the PHC CWS was revised to reflect new information and key issues raised by stakeholders and scientists through a technical review conducted five years post-endorsement.

Introduction

PHC contamination is one of the most common forms of soil and groundwater contamination in Canada. When released to the environment PHC can pose significant risks, including fire/explosion hazard, human and environmental toxicity, movement through soil to air or water, odour, and impairment of soil processes such as water retention and nutrient cycling. The large numbers of sites and the extent of contamination make this a multibillion dollar problem in Canada. Precise management is needed to protect human health and environment while controlling costs. The PHC CWS provided regulators and the public with a consistent management tool

The PHC CWS was endorsed by Ministers of Environment, with the exception of Quebec, in May 2001. The PHC CWS includes commitments for jurisdictions to report to Ministers and to the public on implementation of the PHC CWS at specified intervals. The PHC CWS also included a commitment to review additional scientific and technical information in order to reduce information gaps and uncertainties. This report represents a summary of the revisions to the PHC CWS, ongoing implementation actions for Canadian jurisdictions and will serve as the second report to Ministers.

Description of the Standard

The PHC CWS is a remediation standard that specifies the environmental endpoints and assessment procedures necessary to address releases of PHC to the soil and subsurface environment under four land uses. In order to address the diversity of PHC types (e.g., crude oils, light fuels, lubricants) CCME defined four hydrocarbon fractions. The standard is based on an application of risk analysis that identifies acceptable concentrations of each PHC fraction in soil in consideration of exposure pathways and protection goals for receptors (humans, plants, animals) applicable for each land use. The standard does not specify timelines for identification or response to individual PHC releases. Jurisdictions make these determinations in relation to release reporting, complaints, redevelopments and land transfers.

2008 Revisions to PHC CWS

Early in 2005, stakeholders were contacted and requested to provide submissions of any new information arising after the signing of the PHC CWS in 2001. Several key issues were identified and three technical advisory sub-groups were established to review the information and make recommendations on the key issues. A revised draft PHC CWS was submitted for public comment in 2007. Based on the comments and a socio-economic review the revised PHC CWS was approved and published in 2008.

The text of the 2001 PHC CWS itself was not revised; however, Table 1 was changed to reflect toxicity testing and field studies conducted since the PHC CWS was implemented. Other changes to the Standard included revisions to some of the pathway models, default model parameters, and derivation methods (these are all outlined in the scientific rationale available on the CCME website). Within the matrix of land uses, soil textures and hydrocarbon fractions, some allowed values increased while others decreased. A socio-economic analysis of these changes concluded that in general there would be only minor changes to overall site cleanup costs in most cases, with a significant increase in costs restricted to a very narrow range of scenarios. The other supporting documents, e.g., user guidance and scientific rationale were revised to reflect the changes.

Responsibilities of Jurisdictions

Canada-wide standards are enabled by the sub-agreement on standards under the Harmonization Accord, which was endorsed by Ministers in January 1998. The Sub-Agreement distinguishes two types of CWS. Those developed under Clause 6.2 of the Sub-Agreement require development of shared (trans-jurisdictional) implementation plans and coordinated implementation actions and reporting. Conversely, specifics of implementation are entirely up to individual jurisdictions for CWS developed under Clause 6.1 of the Sub-Agreement on Standards. The PHC CWS was developed under Clause 6.1.

Jurisdictional responsibility for *reporting* on implementation of the PHC CWS is specified in Section 5 of the PHC CWS Ministerial Agreement. Ministerial reports are required on a 5-year basis commencing in 2003. This report responds to the 2008 CWS requirement for reporting to Ministers and the public on a 5-year basis.

Consultation and Training

Most jurisdictions met their consultation requirements through the national CCME process to develop the PHC CWS. Most jurisdictions also participated in the national multi-stakeholder roll-out workshop held in May 2001. Most jurisdictions have continued providing consultation and training. Jurisdiction specific consultation and training activities are indicated below.

Benefits and Challenges

Jurisdictions have noted the following benefits and challenges when implementing the PHC CWS.

Benefits identified include:

- Consistency in approaches and outcomes across Canada;
- Approach based on current science;
- Flexibility to address different land uses, soil textures, exposure pathways, depths and tiers;

- Effectively deals with disparate product types; and
- The requirements are clear; proponents understand what is expected of them.

Some challenges to the implementation of the PHC CWS include:

- The standard does not explicitly address weathered or bio-treated PHCs;
- Organic soils and forest soils are not explicitly addressed;
- Continuity and comparability with assessments conducted prior to the release of the standard (or the revised standard);

Other issues that are currently being investigated include:

- Soil quality guidance for n-hexane required;
- Analysis of irritancy data with respect to exposure to F1 C6 to C8 aliphatic hydrocarbons;
- Development of protocol for soil vapour sampling;

Implementation Actions – Summary of Jurisdiction Activities

British Columbia

BC has not yet adopted the CCME PHC CWS soil quality guidelines for direct use under the Contaminated Sites Regulation.

BC elected not to adopt the original 2001 PHC CWS guidelines for regulatory purposes based on concerns and recommendations forthcoming from a 2003 detailed review of the PHC CWS conducted for the ministry by the Science Advisory Board (SAB) for Contaminated Sites in British Columbia. The SAB noted that differences in derivation rationale, defined exposure scenarios and underlying science policy decisions exist between CCME and BC. As a result it was concluded that the CWS would require some revision to be consistent with the BC contaminated site regulatory regime.

The SAB also recommended that BC move as expeditiously as possible towards replacing the existing professional judgment based generic soil standards for petroleum hydrocarbons found within Schedule 4 of the Contaminated Sites Regulation with risk based matrix soil standards developed using the ministry's soil standard derivation protocol suitably modified to incorporate new elements contained in the CCME approach. Further, to ensure an appropriate and consistent level of environmental protection, the SAB recommended that BC should initiate a review and re-assessment of its current soil standards derivation protocol with the aim of updating the protocol to reflect current "best science" and facilitate the subsequent recalculation of existing matrix soil standards for all substances currently listed within Schedule 5 of the Contaminated Sites Regulation.

BC has recently funded the SAB to provide specific recommendations related to updating, based on current best science, the Ministry's existing soil standard derivation protocol. That review will include consideration of the new January 2008 technical supplement and revised and updated scientific support documents for the CCME PHC CWS. Following ministry review of pending SAB recommendations and subsequent finalization and stakeholder review of an updated ministry soil quality standards derivation protocol, BC will re-consider possible

adoption of the PHC CWS soil quality guidelines under the Contaminated Sites Regulation. Should direct adoption of the CCME PHC CWS guidelines ultimately not be possible, BC will continue to ensure that any updated PHC soil quality standards of the Contaminated Sites Regulation provide equivalent or better environmental protection to that attained by the CCME PHC CWS.

Yukon

The Yukon has not yet implemented the PHC CWS; however, the Yukon *Contaminated Sites Regulation* is in the process of being amended with one of the major amendments being the adoption of the PHC CWS.

As part of the regulation amendments, the following implementation steps have already been undertaken:

- a) Research to determine how other jurisdictions have incorporated the PHC CWS, what has worked, what has not.
- b) Development of options for the incorporation of the PHC CWS into the CSR.
- c) Re-activation of the Contaminated Sites Advisory Committee during the CSR amendment process for the purpose of soliciting input from affected parties, other government agencies, First Nations, and interested non-governmental organizations.

The following additional steps remain to be undertaken to amend the regulation and implement the PHC CWS:

- d) A 60-day public review period, with information made available to the public via a variety of media.
- e) After an affirmative Cabinet decision regarding the amendments, implementation activities including preparing and distributing factsheets to explain the amendments, and possibly providing workshops to local consultants regarding the use and application of the new standards.
- f) Additional staff training to ensure that the PHC CWS is correctly interpreted when evaluating contaminated sites submissions from proponents may be required.

It is currently anticipated that the regulation amendment process will be completed by the end of 2008.

It is estimated that the PHC CWS will apply to some 150-plus contaminated sites within the Yukon that have not yet been fully assessed and/or remediated. Additionally, Canada applies the PHC CWS to some 200-plus sites that are the subject of assessment and/or remediation under the Yukon Devolution Transfer Agreement.

Alberta

Alberta has applied the PHC CWS at petroleum contaminated sites since adoption of the standard in June 2001. Hydrocarbon contamination is found most commonly at upstream oil and gas facilities and petroleum storage tanks sites, where the PHC CWS has provided a common management benchmark for assessment and remediation.

Alberta coordinates implementation of the PHC CWS across three Departments: Environment, Sustainable Resource Development and the Energy Resources Conservation Board (Energy). Joint information and input sessions were held throughout the development of the 2001 standard. Implementation of the 2001 standard occurred in four phases: (a) revision of regulatory products, (b) training sessions for internal staff, (c) rollout workshops, and (d) monitoring and support. The 2001 PHC CWS was reviewed by the Sustainable Development Coordinating Committee, which includes Deputy Ministers from several Departments including Environment, Energy, and Sustainable Resource Development.

The 2008 PHC CWS was incorporated into the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* and *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*, released in June 2007. The Tier 1 and Tier 2 guidelines received public review before finalization. Because the 2008 CWS was a revision rather than a new product, no other implementation activities were undertaken. Upstream oil and gas sites were given a 6-month phase-in period, ending on Dec. 1, 2007, during which they could complete projects under the 2001 standard. The 2008 PHC CWS is now fully implemented for all contaminated sites.

No specific regulations were passed to support the PHC CWS. However:

- Tier 1 and 2 remediation guidelines incorporated the 2008 PHC CWS;
- Guideline values in the PHC CWS for soil-to-groundwater pathways were calibrated to respond to Alberta's climate;
- An equivalency protocol, released in 2003 for performance-based elements of the PHC CWS analytical method, has been used to approve 3 methods at 7 laboratories;
- Demonstration of compliance with the PHC CWS is an application requirement under the reclamation certification program for upstream oil and gas facilities;
- Demonstration of compliance with the PHC CWS will be an application requirement under the proposed Remediation Certificate Regulation; and
- Revisions to the Code of Practice for Land treatment of Soil Containing Hydrocarbons that incorporate the 2008 PHC CWS have been completed and will be released soon.

Saskatchewan

The PHC CWS has been applied to all sites throughout Saskatchewan since the introduction of Environmental Protection Bulletin 344, *Risk Based Corrective Actions for Petroleum Hydrocarbon Impacted Sites* in 2006. No specific regulations were passed to support implementation of the PHC CWS. The *Hazardous Substances and Waste Dangerous Goods Regulations* provides the regulatory backdrop for implementing and enforcing the program in Saskatchewan.

The Saskatchewan Ministry of Environment is currently reviewing the existing regulations, and policy with respect to impacted sites including PHC's. It is planned to complete the consultation in 2008.

Supplementary consultations were delivered in Saskatchewan by making presentations to stakeholders and providing information on the Saskatchewan Ministry of Environment website.

Manitoba

Manitoba began its planning activities for implementation of the standard during the development of the standard. Discussions and information exchange between Contaminated Site Program staff and Regional Operations staff was conducted. Specific tasks were identified including review of regulations, guidelines, codes of practice and standard operating procedures, and development of consultation workshops and staff training.

No specific regulations were passed to support the PHC CWS. The PHC CWS was adopted pursuant to section 57(1) of The Contaminated Sites Remediation Act. The following Manitoba guidelines were amended to reflect the application of the PHC CWS in Manitoba:

- A Guideline for the Dismantling and Removal of Underground and Aboveground Petroleum Storage Tank Systems in Manitoba June 1991
- Manitoba Guideline 98-01 – Guideline for Environmental Site Investigations in Manitoba
- Manitoba Guideline 96-05 – Treatment and Disposal of Petroleum Contaminated Soil June 1996
- Contaminated Soil Criteria for Acceptance at Licensed Waste Disposal Grounds 2002-02E

Consultations supplementary to the national process were delivered in Manitoba specifically targeting stakeholders and information on the PHC CWS was provided on Manitoba Conservation (Environment) and CCME web sites.

Manitoba continues to apply the PHC CWS to all hydrocarbon impacted sites identified in the Province, and the Standard is reflected in applicable environmental guidelines. These risk based standards have allowed Manitoba Conservation staff to determine if concentrations identified pose a risk to human health or the environment.

Training of staff on the application of the PHC CWS is on-going as new personnel begin work in the Province's Contaminated Sites Program. Manitoba Conservation staff continue to respond to stakeholder inquires on an ongoing basis.

Northwest Territories

The Government of the Northwest Territories (GNWT) revised the Environmental Guideline for Contaminated Site Remediation in November 2003 incorporating the PHC CWS. At that time, the Department of Environment and Natural Resources consulted with interested stakeholders including territorial and federal departments, the Northwest Territories Power Corporation and the Association of Professional Engineers, Geologists, and Geophysicists of the Northwest Territories and Nunavut (NAPEGG). Presentations were also made at NAPEGG technical

workshops in Yellowknife before and after the guideline revisions. The PHC CWS has been applied to 112 contaminated site management projects under GNWT jurisdiction in the Northwest Territories. This does not include federally managed contaminated sites.

Ontario

The Record of Site Condition Regulation (O.reg.153/04) was passed in June 2004 effectively incorporating the PHC CWS in the Soil Groundwater and Sediments Standards for use under part XV.1 of the *Environmental Protection Act*. As of October 1, 2004, the PHC CWS has been applied to all hydrocarbon contaminated sites for which a Record of Site Condition is filed. Since then, the PHC CWS has been applied to hundreds of sites across Ontario.

Ontario continues to evaluate the incorporation of the PHC CWS (particularly the Tier 1 criteria) in the Regulations developed and finalized under the Brownfield's legislation, and is currently in the process of revising its Tables of Site Condition Standards. As part of the revisions, Ontario has revised many of its processes of developing soil standards to be more in line with those used by CCME as per the CCME protocol documentation. In order to maintain consistency across all substances listed in the Tables of Site Condition Standards, the current proposal is to utilize the same processes for all substances. This results in the possibility that the standards for PHCs will differ from those in the CWS, but the principle of maintaining at least the same level of protection as the CWS provides is being adhered to. A proposal for the revisions to the Tables of Site Condition Standards was posted on the Environmental Bill of Rights Registry in March of 2007. There has been no indication of a concern regarding the movement away from using CCME CWS numbers, as generated by the CCME, towards using the revised modelling, which is similar, but not identical, to that used by CCME.

Ontario is continuing to consider how to incorporate a Tier 2 process (i.e. modifications to generic criteria such as the CCME spreadsheets) into its handling of petroleum contaminated sites. Consultants inquiring about risk assessment at PHC contaminated sites are being advised of the CCME CWS Tier 2 procedures that may be used in risk assessments for contaminated sites, although there appear to be few situations where the CCME spreadsheets have been used. It is anticipated that a full Tier 2 process might be brought into existence in conjunction with the use of the proposed new Tables of Site Condition standards, should they be implemented in the future.

Nunavut

After the development of the Canada-Wide Standards (CWS) for Petroleum Hydrocarbons in Soil and the endorsement by Ministers, Nunavut committed to updating our Site Remediation Guidelines, which were based on the old CCME standards, to reflect the new standards.

Site remediation in Nunavut is very difficult due to a combination of challenges unique to the territory. These include: harsh/extreme climate, permafrost, small population spread over a very large land mass, primitive municipal infrastructure, high transportation costs, lack of a road system and a paucity of trained response personnel. Currently there is only one firm in Nunavut that specialized in spill response operations.

Nunavut still intends to review and update its Environmental Guideline for Site Remediation so that it reflects the new CCME CWS for Petroleum Hydrocarbons, however, with a busy workload and limited staff, this goal has been deferred due to more pressing issues which require immediate attention.

Currently, Nunavut is officially going by the old CCME standards, however, we are also accepting the new CCME standards if our clients wish to employ them. In the interim we have been making use of the NWT's updated Guidelines.

Atlantic Provinces (Newfoundland, Nova Scotia, New Brunswick, Prince Edward Island)

There is a harmonizing agreement between the Atlantic Provinces for the use of the Atlantic Partnership in RBCA Initiative (PIRI) PHC Guidelines that have been generated using Atlantic PIRI RBCA model. The Atlantic PIRI RBCA model was modified in 2003 to incorporate new scientific information used by the PHC CWS. As there are still some differences between the PHC CWS and the Atlantic PIRI PHC guidelines, the Atlantic Provinces are currently reviewing the recent revisions to the PHC CWS to determine if the Atlantic PIRI PHC guidelines need further modifications in order for the Provinces to meet their commitment under the CWS agreement.

Canada

Of the 7,049 known contaminated sites currently listed on the Federal Contaminated Sites Inventory (FCSI), 3,866 or about 55% have been contaminated with petroleum hydrocarbons (PHCs). The number of PHC-contaminated sites on the FCSI has increased from the 650 referenced in the 2003 report mainly due to the extensive assessment activities that have occurred since then and also due to the more rigorous reporting requirements imposed on federal custodians of contaminated sites.

Since the 2003 implementation report, there have been significant regulatory changes that will improve the way in which PHCs are handled, thus potentially reducing releases of PHCs and consequently reducing the creation of new PHC-contaminated sites. The proposed *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* have a broader scope of application than the existing regulations respecting storage tanks on federal and aboriginal lands and provide a more comprehensive framework to effectively prevent pollution from storage tank systems in the Federal House. The Canada Wide Standard for Petroleum Hydrocarbons (PHC CWS) will be a valuable tool for tank owners who conduct assessments or

remediation associated with storage tanks that will require attention as a result of the proposed Regulations. The Regulations are expected to come into force in June or July 2008.

In 2005-06, the Federal Contaminated Sites Action Plan (FCSAP) was created. FCSAP includes a commitment of \$3.5 billion over 15 years to reduce human health and ecological risks, as well as federal financial liabilities, associated with the highest priority federal contaminated sites. One of the main benefits of using the PHC CWS on a national basis is that it ensures more consistent decision-making regarding the management of PHC-contaminated sites. Accordingly, FCSAP guidance and Treasury Board (TB) policy advocate use of the PHC CWS at federal contaminated sites. However, TB policy does allow the use of equivalent guidelines or standards (e.g. provincial) when the PHC CWS is technically or economically inappropriate in a particular situation.

During the period of 2003/04-2007/08, the degree of use of the PHC CWS at federal contaminated sites varied by region of the country. The Atlantic Provinces continue to prefer the Atlantic Risk Based Corrective Action (RBCA) process; they used the PHC CWS during assessment or remediation activities at federal sites in less than 1% of cases. The reasons most often cited for this preference are that Atlantic RBCA includes groundwater criteria whereas the PHC CWS does not, and that analytical costs are lower using the Atlantic RBCA since analysis for PHC CWS often requires shipment of samples to other provinces. There is also a sense of greater regional support for the Atlantic RBCA process.

Other regions of the country relied on the PHC CWS more heavily, especially in Ontario where it was utilized in about 75% of the assessment and remediation activities at federal contaminated sites during 2003/04-2007/08. Partial use was reported in the western provinces and the Territories (approximately 50%) and in Quebec (approximately 20%), with provincial/territorial guidelines or standards utilized at the remainder of the federal contaminated sites. Federal custodians have pointed to several factors which tend to discourage the use of the PHC CWS, including future non-federal land ownership; agreements with provincial/territorial or municipal partners; the spread of contamination beyond federal lands; and the lack of groundwater guidance in the PHC CWS.

Ongoing issues and challenges pertaining to implementation of the PHC CWS at federal contaminated sites are being evaluated by a sub-committee of the federal Contaminated Sites Management Working Group (CSMWG). This sub-committee was established in 2003 but has been inactive until recently. The re-established sub-committee, which is co-chaired by Environment Canada and Health Canada, will be asked to examine the reasons why federal custodians are using alternatives to the PHC CWS in order to establish consistent criteria for determining when alternative guidelines or standards may be considered appropriate. The sub-committee will also respond to technical questions about PHCs and use of the PHC CWS and establish guidance to respond to implementation issues that are beyond the technical scope of the PHC CWS. The CSMWG will continue to urge federal custodians of contaminated sites to use the PHC CWS in order to honour the federal government's commitment to the fullest extent possible.

In support of increasing understanding and implementation of the Standard, Environment Canada will continue to provide training to federal custodians of contaminated sites on using the PHC CWS.