BRITISH COLUMBIA
Ministry of Environment

15
FACTS
ON CONTAMINATED SITES

August 2005

Why Protect the Environment

Some contaminated sites stakeholders ask why it is important, or necessary, to protect the environment at contaminated sites. They note, for example, that because some sites are paved, the ability of soil to support the growth of plants and soil organisms no longer matters. There are, however, several key reasons the ministry must ensure that the environment at a contaminated site is protected:

Environmental reasons – Even if a site does not pose a threat to people, it can still be an environmental hazard. Soil, water, and sediment at the site may contain substances that can poison plants and animals. Such sites may also release substances offsite that can:

- injure fish or mammals;
- impair the reproduction of birds; and
- accumulate in the food web.

These effects may be severe enough to impair or imbalance ecological functions or systems.

Legal reasons -- The ministry's mandate under the *Ministry of Environment Act* is to "encourage and maintain an optimum quality environment through specific objectives for the management and protection of land, water, air and living resources." This is largely done through the *Environmental Management Act* and regulations such as the Contaminated Sites Regulation.

How does the Contaminated Sites Program use standards to protect the environment?

As a means of helping ensure that potential hazards are addressed appropriately and the legislative mandate is fulfilled, both numerical and risk-based standards are set in the Regulation (see Fact Sheet 13, "Environmental Quality Standards," for more information).

The numerical standards approach

In the numerical standards approach, environmental protection is carried out through the use of environmental quality standards. These define, for example, what maximum level of a substance is allowed in water at sites to protect aquatic life.

About 95% of all the sites remediated in BC have used the numerical standards approach. The Contaminated Sites Regulation describes three types of numerical standards and criteria for application to soil, water, and sediments.

Soil numerical standards

- *Generic numerical soil standards* consist of single values for each of five land uses. They combine both human health and environmental protection in one standard.
- *Matrix numerical soil standards* separate human health and environmental protection requirements. Standards are calculated for various site-specific factors. Those for environmental protection address the protection of: soil invertebrates and plants; livestock ingesting soil and fodder; soil microbes; and groundwater used for aquatic life, livestock watering, and irrigation.
- *Site-specific numerical soil standards* can often be developed from the same equations and models used to develop the matrix numerical

soils standards, if sufficient site-specific information is available. Protocol 2: "Site-Specific Numerical Soil Standards," describes the procedures for doing this.

Why are the soil invertebrate and plant standards mandatory?

Soil invertebrates and plants are the most common environmental organisms found on contaminated sites. In addition, for common substances, standardized toxicity data exists for earthworms and leafy plants that grow quickly (such as lettuce). These can be used as surrogate species for developing numerical soil standards.

How much protection do the mandatory soil standards provide?

Standards governing the toxicity to soil invertebrates and plants provide differing levels of protection, based on the land use identified for a site. They are not "zero impact" or "no effect" standards: at sites cleaned up to meet the standards for protecting soil invertebrates and plants from toxicity, there may still be some adverse impact on terrestrial organisms. This is particularly true for the commercial and industrial soil standards, where the level of protection is the least stringent.

Is a standard protective if it allows adverse impacts to occur?

The standards protect communities of organisms, not individual organisms. Within an ecological context, it is considered acceptable to tolerate some adverse impact on individual organisms, as long as protection at the species level is maintained.

Who developed the matrix standards for soil?

The Contaminated Sites Soil Task Group (CSST) developed the standards. It took the Canadian Council of Minster's of the Environment (CCME) national guidance on environmental health protection at contaminated sites and adapted it to derive the standards (see Fact Sheet 13).

Water numerical standards

- *Generic numerical water standards*, set out in Schedule 6 of the Regulation, are requirements to protect the environment from unacceptable ground- and surface water quality at sites. Standards related to aquatic life, livestock watering, and irrigation help ensure that animals and plants using water are protected.

- *Site-specific numerical water standards* can be used to modify the generic aquatic life protective standards set out in Schedule 6 (see Protocol 7: "Regulation of Petroleum Hydrocarbons in Water under the Contaminated Sites and Special Waste Regulations"). As is the case with the generic numerical soil standards, ministry-approved site-specific numerical water quality standards (SSSw) may be used to determine if a site is a contaminated site (as defined in the legislation), or if a contaminated site has been satisfactorily remediated.

Sediment numerical criteria

- Generic numerical sediment criteria, set out in Schedule 9 of the Regulation, are provided for sensitive and typical sediment use, freshwater, and marine and estuarine water.

  Like the matrix numerical soil standards, these are not completely protective. *At sites with sensitive habitat*s, the principal goal is to restore sediments to a state that will facilitate restoration of productive and diverse benthic macroinvertebrate communities in the *near term*, and to minimize the risks to organisms at higher trophic levels in the food web. These sediment quality criteria define concentrations of substances below which there is a relatively

low probability (about 20%) of significant adverse effects in standardized toxicity tests with sensitive benthic species and life stages.

At typical contaminated sites, the principal goal is to restore sediments to a state that will facilitate restoration of productive, diverse benthic macroinvertebrate communities in the *longer term*, and to minimize the risks to organisms at higher trophic levels in the food web. For this reason, the criteria were established at levels that provide a moderate level of protection for sediment-dwelling organisms. They define the concentrations of substances below which there is a moderate probability (about 50%) of significant adverse effects being experienced by sensitive benthic species and life stages.

The risk-based approach

The risk-based approach requires that an environmental risk assessment report be prepared and submitted to the ministry for evaluation and possible future action.

Protocol 1: "Recommended Guidance and Checklist for Tier 1 Ecological Risk Assessment of Contaminated Sites in British Columbia," directs consultants how to prepare these assessments.

Review of standards and criteria by independent experts

Early in their development, the Regulation's soil and water standards for environmental protection were reviewed by two separate panels composed of independent ecological experts. Both panels reconfirmed the need for environmental protection standards and made recommendations for minor changes and future research to improve them. The ministry followed up on many of these recommendations in drafting the Contaminated Sites Regulation.

Later during their development, the sediment criteria were subjected to detailed scrutiny by many stakeholders – particularly federal government scientists who also have a regulatory role in managing this environmental medium.

Most recently, the Minister's Advisory Panel on Contaminated Sites called for a general review of the procedures followed to update the standards in Schedules 4–6 of the Regulation. The ministry has embarked on this process, with the assistance of the new Science Advisory Board.

Note: This summary is solely for the convenience of the reader. The current legislation and regulations should be consulted for complete information.

For more information, contact the Environmental Management Branch at site@gov.bc.ca