

Ecological Risks from Bioaccumulative Chemicals in Sediment

Issue

What Sediment Management Standards (SMS) rule revisions (if any) are needed to provide clear and predictable sediment cleanup standards that protect biota from bioaccumulative chemicals at sediment cleanup sites?

Problem Statement

History

The SMS were adopted in 1991 to implement Ecology's responsibilities under several laws, including the Model Toxics Control Act (MTCA) and the Water Pollution Control Act. At that time, chemical and biological criteria were developed to protect benthic organisms from acute and chronic toxicity. However, the chemical and biological criteria were not specifically established to protect the benthic community or other biota from bioaccumulative chemicals. Although some progress has been made regarding bioaccumulation and risks to human health, risk to biota from bioaccumulative chemicals is not clearly addressed in the SMS.

There has been discussion regarding whether or not protection of human health risks from bioaccumulative chemicals would be sufficient to protect biota. In February 2009, the Regional Sediment Evaluation Team (RSET) released an analysis of both human and ecological risks from bioaccumulative contaminants¹. This included the development of target tissue levels for the protection of human health for a wide range of consumption levels for mammals and birds (target species). Target tissue levels (standards) for ecological receptors were developed for several options:

- Protection of populations not listed in the Endangered Species Act.
- Protection of individuals listed in the Endangered Species Act.
- Values for nearshore versus deep water conditions.

RSET concluded that, for most compounds tested, tissue levels to protect human health at general consumption rates (54 grams per day) were generally lower than levels needed to protect target species. However, this conclusion does not apply to subsistence fisher

¹ https://www.nwp.usace.army.mil/pm/e/rset/sef/2009_SEF-DraftFinal.pdf

consumption rates which are significantly higher than 54 grams per day. In addition, target tissue levels were not developed for fish. Therefore, protection of human health of subsistence fishers and ecological health of fish cannot be directly inferred by these results.

Current approach to evaluate ecological protection from bioaccumulative effects at contaminated sediment sites.

Currently, the process to develop cleanup levels protective of biota from bioaccumulative chemicals are conducted on a site-specific basis. To assess risk to biota, both aquatic (invertebrates and fish) and upland (mammalian and avian) target species impacted by contaminated sediments either directly or through the food web are identified. Bioaccumulation and trophic transfer of contaminants are then predicted using various models to develop target tissue levels. These models can include the “mammalian predator” model from MTCA Table 749-4 and a scientifically rigorous aquatic bioaccumulation model such as the Gobas model (<http://www.rem.sfu.ca/toxicology/models/models.htm>). The predicted target tissue levels are then compared to current scientific literature values to determine the risk to the target species.

Overview

The intent of the [SMS](#) rule is to reduce and ultimately eliminate adverse effects on biota and significant human health threats. The SMS has promulgated chemical and biological criteria to protect against non-bioaccumulative adverse effects to biota, specifically acute and chronic toxicity to benthic organisms. The SMS has a stated intent to protect biota from bioaccumulative contaminants which is evident in the definition of “chronic” that includes adverse effects from bioaccumulation and biomagnification.

However, the SMS does not have promulgated criteria to protect biota from bioaccumulative effects. In addition, the SMS does not have a clear process on how to set cleanup standards to protect against bioaccumulative effects to biota.

The MTCA rule has a process to determine cleanup standards to protect against bioaccumulative effects through conducting a Terrestrial Ecological Evaluation. To be consistent with the MTCA rule, we are considering revisions to the SMS rule to clarify how to protect biota from bioaccumulative effects when setting cleanup standards.

Options

When setting sediment cleanup standards, risk considerations to biota are complex. However, most of the major issues (decision making framework, level of protection, procedures) are covered in detail in the issue paper, “Human Health Risks When Setting Sediment Cleanup Standards.” This issue paper will only cover the options for protecting biota from bioaccumulative effects when setting cleanup levels at sediment cleanup sites.

These options include the following:

- Continue using the current approach to develop cleanup levels for bioaccumulative chemicals.
- Develop a narrative standard for the protection of biota from bioaccumulative effects.
- Develop a narrative standard along with guidance for the protection of biota from bioaccumulative effects.
- Adopt numeric criteria for the protection of biota from bioaccumulative effects.
- Adopt biological criteria for the protection of biota from bioaccumulative effects.

Factors to Consider When Selecting an Option

The development of the amendments will involve the consideration and balancing of a number of issues and interests. The proposed options will also be developed to satisfy several, sometimes conflicting, regulatory goals, including the following:

- Whether the option provides for the selection of cleanup actions that protect human health and the environment.
- Whether the option provides for developing scientifically and legally defensible cleanup standards.
- Whether the option provides consistent standards and methodologies for assessing and managing risk.
- Whether the option provides flexibility to address site-specific factors.
- Whether the option promotes efficient and cost-effective cleanup of contaminated sites.
- Whether the option provides enhanced opportunities for public involvement.
- Whether the option improves the clarity and usability of the rule.
- Whether the option complies with key requirements of the Administrative Procedures Act.