

**Thresholds List for Potential Use in the Hanford Natural Resource Damage Assessment  
Yakama Nation ERWM Program Comments**

The Yakama Nation submits the following comments regarding the overall purpose and organization of the document, comments specific to the thresholds presented, and some recommendations.

**Purpose.** The text could be clearer regarding the purpose of the document and what exactly the authors hoped to accomplish with the compilation. The authors offer a reasonable suggestion of associating threshold exceedances with the degree of service loss for radionuclides, but do not follow through with how to apply the data presented in the tables for such a purpose. No such approach is presented for the chemical substances. A clearer discussion of the use of thresholds in the NRDA process, including the PED, would be helpful. It is important to explain that most of the threshold values presented are based on specific data and have a fairly specific interpretation by the author(s) or promulgating agencies. For example, the chronic ambient water quality criteria are intended to be protective of 95% of aquatic organisms; they are not “no-effect” thresholds. Any inter-comparison among the thresholds should ensure that the toxicological basis for the thresholds is explained. Such a review may also be very helpful in determining how a particular threshold might support an injury determination.

**Organization.** Overall, the tables as presented were difficult to follow and could be better organized. For example, assuming the tiered approach is appropriate, the Tier 1 values should be included together and listed first since they are presented as being of greater value in the injury determination than the rest. The tables do not appear to include thresholds based on drinking water standards (Tier 1), even though the supporting text notes that exceedances of those standards constitute clear injuries to surface water. In the sediment tables, the threshold effects concentrations (“TEC-types”) and the probable effects concentrations (“PEC-types”) should each be listed together so that the ranges of values are more evident within each group. The Michelson-based Sediment Quality Values (SQVs) are as yet proposed values, and would likely not currently qualify as Tier 1 (as identified in Table C-3).

**Threshold Values.** It is helpful to maintain the two types of thresholds that the authors identified, the “no-effect” thresholds and the significant-effect thresholds, even if the latter is usually poorly defined with regard to possible service loss/degree of injury. The use of the term no observable effect level (NOEL) for the Michelson (2003) values arose from the inappropriate use of that term by DOE in the *Columbia River Component Ecological Risk Assessment* to refer to all no- and low-effect screening concentrations. Michelson values are derived TEC-type values, not NOELs. Similarly, MESL and USGS (2002) should be reviewed to determine whether the “SQS” represents TEC- or PEC-type values according to the use of that term in the report.

Much of the data were derived from secondary sources, while the original data should have been presented and cited. In a number of cases, the citation of secondary sources resulted in the presentation of multiple thresholds of identical value, and all were based on the same original sources. For example, there are four identical thresholds for antimony for the protection of soil invertebrates (presented in Table C-7), cited from four sources, but all are based on one original source (EPA 2005e). More importantly, much of the data seems to be outdated. For example, for sediment thresholds:

- Cabbage et al. (1997) is an early attempt by the Washington State Department of Ecology (WDOE) to develop Sediment Quality Standards (SQS). That report provides what the authors



labeled “possible” SQS values. The Cabbage report was superseded by Michelson (2003), which in turn was replaced by Michelson (2011). It is inappropriate to include all three of these reports when the state is moving forward with Michelson 2011, except perhaps for those substances not included in the latter report. Cabbage seems to be inappropriate to list because the SQS were poorly supported by the WDOE and, more importantly, because it has been superseded.

- MacDonald and MacFarland (1999) has been superseded by the Province of British Columbia by more recent analyses (2005).
- Canada maintains an active web site for criteria and standards (revised in 2009 or later), which supersedes and may change the Canadian Council of Ministers of the Environment (CCME, 2002) values.
- The Province of Ontario has a 2008 report presenting much more recent sediment values, Sediment Quality Guidelines (SQGs), than Persaud et al. (1993).
- EPA (1977) seems too old to be credible and has likely been replaced by more current values.

Websites available for current thresholds are listed in the references below. It is worth noting that much of the sediment threshold information originates from MacDonald and his collaborators (Jay Field, Chris Ingersol). Therefore, these individuals could be consulted further to identify the latest values that they would support, and how they would interpret those values in relation to an injury threshold.

Similar issues regarding outdated and superseded values were found with the water and soils thresholds. All of the relevant agencies, The U.S. Environmental Protection Agency (EPA), Oregon Department of Environmental Quality (ODEQ), and WDOE, as well as the Canadian sources, maintain active web sites with the current values for at least the majority of the relevant thresholds (websites are provided in the references below). For example, ODEQ has developed screening tables for sediments intended to be protective of birds and mammals for bioaccumulative substances. ODEQ lists a sediment screening value for total DDTs of 0.43 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) for the protection of birds, which is significantly lower than the 200  $\mu\text{g}/\text{kg}$  listed for DDTs in Table C-4. Similarly, the ODEQ web site lists the chronic threshold (CCC) for arsenic as 190  $\mu\text{g}/\text{L}$  versus the 150  $\mu\text{g}/\text{L}$  listed in Table C-1.

The report could provide a better understanding of the basis for and current relevance of the thresholds that were compiled and presented. With regard to the radionuclide thresholds, the text could provide a coherent rationale for the selection of the 0.1 and 1 radiation absorbed dose per day (rad/d) thresholds, compared to the lower European ones (recommended by WDOE for use in the Columbia River ecological risk assessment). It is premature to suggest decisions regarding selection without a more thorough analysis of the toxicological implications. The Biota Concentration Guides (BCGs) developed by DOE (using those dose limits) cited the 2002 source; a spot check of BCGs using the current ResRad model (version 1.5) confirmed the values as correct.

**Recommendations.** If the document is revised, the Yakama Nation suggests the changes listed below. If not, a next step is to select the current thresholds (from original sources and those that take precedence), including standards identified in the report as Tier 1 standards, and conduct toxicological assessments of these thresholds to determine their appropriate application in assessing degrees of injury at Hanford as part of the injury assessment process.

- Be clear about the purpose of the report – is the goal to offer methods for assessing the degree of injury in applying these thresholds, thereby needing an understanding of the toxicology associated with developing the thresholds, or just a compilation?
- Include all tiers of thresholds in the tables (such as drinking water standards), and organize the tables to group similar types together (e.g., TEC- and PEC-types) to better view the ranges.
- Present values from original and current sources only, rather than from the multitude of secondary sources that may duplicate and report erroneous values.
- Remove outdated or superseded thresholds.
- Better explain the underlying premise behind the thresholds presented, including the purpose, approach, and endpoints of their derivation, to help the reader understand the applicability of the thresholds for the Hanford NRDA.

**References.** Below are select web links to current agency thresholds.

- EPA mid Atlantic Risk Assessment Web Site: <http://www.epa.gov/reg3hwmd/risk/eco/index.htm>
- CCME Water, Sediment, and Soil quality guidelines: <http://st-ts.ccme.ca/>
- Oregon DEQ Water Quality Standards: <http://www.deq.state.or.us/wq/standards/toxics.htm#Cur>
- Oregon DEQ Guidance for Sediment Bioaccumulative Substances: <http://www.deq.state.or.us/lq/pubs/docs/cu/GuidanceAssessingBioaccumulative.pdf>
- Washing DOE: Water Quality Standards: <http://www.ecy.wa.gov/programs/wq/swqs/index.html>
- British Columbia Environmental Quality Guidelines: <http://www.env.gov.bc.ca/wat/wq/#criteria>