UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

May 30, 2007

MEMORANDUM

SUBJECT: CSTAG Recommendations for the Upper Columbia River Site

FROM: Stephen J. Ells **/s/ Stephen J. Ells**
Leah Evison **/s/ Leah Evison**
Co-chairs, Contaminated Sediments Technical Advisory Group

TO: Sally Thomas and Kevin Rochlin, Remedial Project Managers
U.S. Environmental Protection Agency, Region 10

Background

OSWER Directive 9285.6-08, Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (February 12, 2002), established the Contaminated Sediments Technical Advisory Group (CSTAG) as a technical advisory group to "…monitor the progress of and provide advice regarding a small number of large, complex, or controversial contaminated sediment Superfund sites…." The main purpose of the CSTAG is to assist Regional site project managers in managing their sites in accordance with the eleven risk management principles set forth in the OSWER Directive. CSTAG membership consists of ten regional representatives, two from the Office of Research and Development, and two from the Office of Superfund Remediation and Technology Innovation (OSRTI).

Brief Description of the Site

The Upper Columbia River (UCR) site is located in north-central Washington and extends from the U.S.-Canadian border south and west to Grand Coulee Dam, a distance of approximately 147 miles downriver. The UCR site includes both an upstream free-flowing reach of the Columbia River of approximately 15 miles and Franklin D. Roosevelt Lake (Lake Roosevelt), a large reservoir maintained behind Grand Coulee Dam. The transition between the free-flowing river and Lake Roosevelt occurs over a range of several miles depending on lake elevation and river flow rates, in an area known as Marcus Flats. Two Indian reservations border parts of the site: the Confederated Tribes of the Colville Reservation (the Colville Tribe), and the Spokane Indian Reservation. About 128 miles of the shoreline, extending upstream from

Grand Coulee Dam, is managed by the National Park Service as the Lake Roosevelt National Recreation Area.

Previous investigations have identified contamination of the UCR and surrounding upland areas from the Canadian border down to Grand Coulee Dam. In August 1999, the Colville Tribe petitioned the EPA to assess contamination in the UCR. In December 2000, USEPA completed a preliminary assessment and determined that further data collection was warranted. A fund-financed RI/FS was initiated by EPA in April 2004. The Phase I RI included sediment and fish tissue sampling, and sediment toxicity testing.

In 2006, EPA reached a legal agreement with Teck Cominco, whereby they assumed responsibility for conducting a RI/FS, with the exception of the human health risk assessment which will be conducted by EPA. Teck Cominco submitted a draft RI/FS work plan in December 2006 that is currently being reviewed by EPA and other participating parties.

Known and potential contaminant sources to the UCR site include mining and milling operations, smelting operations, pulp and paper production, sewage treatment plants, municipal and agricultural runoff, and other industrial activities. Contaminants of Potential Concern (COPCs) based on Phase I RI data include: antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, uranium, zinc, PCBs, pesticides, dioxins, furans, and PAHs. Subsequent RI phases of investigation and additional contaminant source assessments will be used to further evaluate COPCs.

Teck Cominco operates a smelter located approximately 10 river miles upstream from the U.S.-Canadian border in Trail, British Columbia, Canada. Smelter operations have been underway since 1896. The Cominco smelting complex is the largest identified source of metals to the river. The facility primarily produced lead and silver during the first decade of operation, with zinc production initiated in 1915. Plants for producing nitrogen- and phosphorus-based fertilizers were built in 1930. This facility either produces or has historically produced lead, zinc, cadmium, silver, gold, bismuth, antimony, indium, germanium, arsenic, mercury, sulfuric acid, liquid sulfur dioxide, ammonia, ammonium sulfate, and phosphate fertilizers. The smelter complex has discharged liquid effluent and water-granulated fumed slag into the Columbia River, including a number of accidental spills and releases to the river. Historical discharges dating back to the late 1800s include an estimated 13 million tons of sand-sized smelter slag, a large volume of liquid effluent, and spills, process bypasses, and emergency releases. Beginning in 1977 a number of pollution prevention and control measures were implemented including the installation of a liquid effluent treatment plant in 1981. Discharge of slag to the river ceased in 1995. These actions reduced metals loading to the UCR site. Teck Comino has stated that all Washington State water quality standards for metals are currently being met in the Columbia River at the U.S. border.

Several sources of PCB releases have been identified within the Spokane River, a tributary to Lake Roosevelt. Many of these sources are in the vicinity of Spokane, WA. Other potential sources of contaminants include municipal storm sewers, municipal sewage, and non-point sources. It has been documented that PCBs were historically used at the Teck Cominco smelter as well as the Celgar Pulp Mill in Castlegar, B.C., located approximately 30 river miles upstream of the U.S.-Canada border. The Celgar Pulp Mill has also been identified as a source of dioxin and furan discharges to the Columbia River prior to mid-1993, when the mill was updated and ceased use of the elemental chlorine bleaching process.

Two key factors affecting the distribution of sediments and contaminants within the site are the Columbia River flows and the operation of Grand Coulee Dam. Other factors include inflow from the numerous tributaries to Lake Roosevelt, of which the Spokane River is the largest, and sloughing and slumping of side banks. Upstream from the border, flow in and into the Columbia River is controlled by numerous dams. On average, the Columbia River at the border contributes about 89 percent of the flow entering Lake Roosevelt. The Spokane River contributes about 7 percent. Each year, starting in early winter and ending in early May, the water level in the Lake is drawn down in anticipation of the winter snow melt that increases upstream flows. Typcially this annual draw down is about 40 feet, but can be as great as 80 feet in years with an expected large snow melt. A detailed assessment of flow velocities over a full range of river flows and reservoir levels has not been conducted.

The CSTAG visited the site and met with the Remedial Project Managers (RPMs) from April 23 to 25, 2007. Eight stakeholder groups associated with the site were invited to present their ideas and concerns about the project to the CSTAG. All invitees made presentations to the CSTAG including the United States Department of Interior (Bureau of Reclamation); Washington State Department of Ecology; Teck Cominco; the Spokane Tribe; Citizens for a Clean Columbia; the Colville Tribe; the Lake Roosevelt Forum; and the Eastern Washington Council of Governments. Additional technical comments were submitted by the Citizens for a Clean Columbia.

CSTAG Recommendations

Based upon our site visit, a review of the site information provided to us, and the presentations made by stakeholders, the CSTAG offers the following recommendations to the site managers to more fully address the 11 sediment management principles. The CSTAG expects that the site RPMs will consider these recommendations as the site characterization continues, as the conceptual site model is refined, and, if warranted, as remedial alternatives are developed and evaluated. The site managers are asked to submit, within 60 days, a written response to these recommendations to the CSTAG co-chairs

<u>Principle #1, Control Sources Early</u>

- Conduct monitoring to determine the contaminant loads that enter the UCR site at the Canadian border.
- Determine which tributaries may be contributing meaningful contaminant loads to the UCR, and conduct monitoring in those tributaries to determine the load.
- Further evaluate the source and potential significance of the apparent loading of PCBs to the UCR between River Miles 687 and 690.

Principle #2, Involve the Community Early and Often

- In an effort to further improve relations with the affected communities, clarify which draft reports and other site documents will be provided to the public for review. EPA should also explain how it plans to consider public comments as well as any unsolicited comments submitted on documents not undergoing a formal public review.

Principle #3, Coordinate with States, Local Governments, Tribes, and Natural Resource Trustees

- The CSTAG commends the Region 10 UCR Site Team in its efforts to work effectively with the State, Tribes, and Natural Resource Trustees.
- CSTAG supports Region 10's outreach efforts in trying to garner upstream UCR environmental data and Trail smelter operational information from Teck Cominco, Environment Canada, and the British Columbia Ministry of Environment.
- Consider gathering information to estimate fish ingestion rates among Colville tribal members.
- Evaluate whether other non-tribal ethnic groups living adjacent to the study area are represented within the range of exposure scenarios to be evaluated in the human health risk assessment.

Principle #4, Develop and Refine a Conceptual Site Model that Considers Sediment Stability

- The existing EPA Conceptual Site Model (CSM) is too generic and implies that little is known about the site. The data available from EPA's Phase 1 effort should be used to refine the CSM.
- Use existing site data to perform a preliminary risk assessment and use the findings along with the refined CSM to prioritize and identify the most significant exposure pathways that are expected to be the greatest contributors to overall site risk. This information should be used to effectively target the upcoming sampling programs. This streamlining should also facilitate reaching earlier cleanup decisions.
- If the baseline risk assessment documents unacceptable site risks, a background contamination analysis may need to be completed. This should include consideration of the potential load of naturally occurring metals into the UCR due to the sloughing of riverside banks and cliffs and development of contaminant background levels for sediment, surface water, and fish.
- As part of the refinement of the CSM and if warranted based on the preliminary risk analysis, evaluate potential risks to human health at potential exposure locations not previously evaluated, such as the Lock picnic and camping area and nearby "swimming hole" identified by stakeholders.
- Determine the amount of contaminant releases to the water column within the UCR site from the slag in the thalweg/main channel and from the deposits at Marcus Flats; from the fine-grained sediment in the littoral areas; and from the slag at the black sand beaches and bars. Evaluate the relative significance and contribution of these fluxes to potential site risks.
- Evaluate the effects that the annual water level changes and the changes in redox conditions might have on the contaminant fluxes from the slag and sediments.
- Conduct water-column monitoring at several locations within the UCR and at the Grand

Coulee Dam in order to develop a contaminant mass balance for the overall site and between the major segments of the site; *i.e*., the upstream river, the transition zone near Marcus Flats, and the Lake. Monitoring should be conducted at a frequency that will reflect potential differences due to changing pool elevations. Additional studies should be conducted to determine whether there may be different strata in Lake Roosevelt that impact contaminant fate and transport.

- The CSTAG currently does not have sufficient information to determine whether a complex numerical sediment transport and/or a contaminant transport and fate model is necessary to evaluate the effectiveness of potential remedial alternatives at the site. *If* it is determined that at least a sediment transport model is likely to be necessary, the following tasks should be performed:
    - Conduct a bathymetric survey within the UCR site to use in setting up the hydrodynamic and sediment transport models.
    - Conduct a Sedflume or equivalent study to evaluate sediment erosional properties (*i.e*., erosion rates and critical shear stress for resuspension) and sediment properties (*i.e*., grain size distribution and bulk density) with depth into the sediment bed. Sedflume cores should be collected in the Marcus Flats area, along the thalweg a short distance downstream of Kettle Falls, and in the fine-grained sediment (i.e., silts and clay) that dominates side embayments along Lake Roosevelt. It is highly recommended that the Sedflume study be performed at the site as opposed to having the cores shipped back to a laboratory for analyses.
    - Measure the settling velocity of the fine-grained sediment (*i.e*., flocs of clays and silts) that is in suspension downstream of the Kettle Falls area.
    - Perform a laboratory flume study to evaluate the transport characteristics of slag and the slag "floaties" that are transported at the water surface. Typically, lab flume studies on sediment transport are performed in a straight, recirculating flume that has a false bottom in which slag material collected from the site is placed. The slag material (containing both slag and sediment) should be collected in a free-flowing portion of the UCR. Evaluate the following properties of slag: 1) settling velocities and erosion rates as functions of slag diameter, 2) critical shear stress for incipient motion, 3) critical shear stress for suspension, and 4) transport modes and properties of the slag (*e.g*., angle of repose). This lab flume study is in addition to the recommended on-site Sedflume study. The latter is not capable of determining the following: 1) settling velocity of slag, 2) transport modes of slag (e.g., is slag transported as bedload, and if so, at what rate as a function of excess bed shear stress), or 3) transport characteristics of the slag (*e.g*., do bedforms occur in slag dominated beds?). It is important to know if bedforms occur as these affect the total drag exerted by the slag on the flow and, therefore, the shear stress exerted by the flow on the slag.
    - Collect TSS data at multiple locations during multiple high-flow events. These data would be used to calibrate and validate the sediment transport model.
    - Once the sediment transport model has been satisfactorily calibrated and validated, evaluate the effects that the annual reservoir drawdown has on

sediment transport in typical years and in years when the draw-down is at the maximum.

Principle #5, Use an Iterative Approach in a Risk-Based Framework

- Evaluate opportunities to accelerate some of the data collection efforts; *e.g.*, institute a phased approach.
- If slag is determined to provide a significant release of contaminants, consider early actions (including pilot or treatability studies) to minimize this loading.

Principle #6, Carefully Evaluate the Assumptions and Uncertainties Associated with Site Characterization Data and Site Models

- Evaluate the degree to which contaminants within the slag material and fine sediments are bioavailable. CSTAG recommends that a sequential extraction procedure be conducted on a subset of sediment samples to determine the concentrations of each geochemical fraction (*e.g*. residual, oxidizable, easily reducible, and exchangeable). The greater the metal concentrations in the exchangeable and easily reducible fractions of the sediment, the greater the likelihood that metals will be released from sediment and thus be potentially bioavailable. [ref: Appendix I, Final RI Report for Ocoee River OU3-R; SAIC/Black & Veatch, July 14, 2005].
- Ensure that detection limits for uranium are adequate to evaluate site risks.

Principle #7, Select Site-specific, Project-specific, and Sediment-specific Risk Management Approaches that will Achieve Risk-based Goals

- The CSTAG will evaluate adherence with this principle later in the process.

Principle #8, Ensure that Sediment Cleanup Levels are Clearly Tied to Risk Management Goals

- The CSTAG will evaluate adherence with this principle later in the process.

Principle #9, Maximize the Effectiveness of Institutional Controls and Recognize their Limitations

- Collect site-specific information to predict the effectiveness of any institutional controls that may be required as part of any selected remedy (*e.g.*, fish consumption advisories).

Principle #10, Design Remedies to Minimize Short-term Risks while Achieving Long-term Protection

- The CSTAG will evaluate adherence with this principle later in the process.

Principle #11, Monitor During and After Sediment Remediation to Assess and Document Remedy Effectiveness

- The CSTAG will evaluate adherence with this principle later in the process.

Regional Response

Please send a written response to these recommendations within 60 days. If you have any questions or would like a clarification to any of these recommendations, please call either Steve Ells at 703 603-8822, or Leah Evison at 703 603-9022.

cc: Dan Opalski, Region 10
Sheila Eckman, Region 10
James Woolford, OSRTI
Betsy Southerland, OSRTI
Doug Ammon, OSRTI
Rafael Gonzalez, OSRTI