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APR 18 1995

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100 AREA CHROMIUM CONTAMINATION

This letter is in reply to the Confederated Tribes and Bands of the Yakama Indian Nation (YIN) letter to Mr. John D. Wagoner from Mr. Russell Jim "Chromium Contamination in Ground Water Plumes Currently Poisoning Fish Spawning in the Columbia River's Hanford Reach; Request for Immediate Action to Remediate Condition and Eliminate Source of Chromium--," dated March 15, 1995, which outlines a number of requested actions to be taken within two months to mitigate upwelling of chromium contaminated groundwater into sections of the Columbia River shoreline in the 100-Area. The YIN letter also requests that the actions be integrated into a plan for mitigation of chromium, that planning be revised to reflect the "urgency with respect to rapid mitigation", and that the YIN be involved with (and concur with) the planning efforts. 40971

The letter presumes that the initial results of sampling performed to date provides adequate basis to justify expenditures to install and operate 500 gallons/minute pump and treat systems at H-Area and each site that may be contributing chromium contamination to the river. At this point, the U.S. Department of Energy (DOE) does not agree with this conclusion for the following reasons:

(1) The initial water quality results are insufficient for final conclusions regarding water quality conditions in salmon redds. In agreement with points raised in the YIN letter, numerous factors may influence the occurrence of chromium-bearing interstitial water in riverbed substrate. These may include preferential pathways for groundwater to flow into the river channel; the dimensions of the interface zone where groundwater and river water meet; and past-practices modifications to the near shore river environment due to reactor construction and operations. The meandering river environment that created the sedimentary framework of the aquifer has resulted in highly variable pathways and rates for groundwater movement. Design of extraction well networks must be balanced with the level of effort to characterize the aquifer being pumped. Plans are included in the work scope for the next year to survey the 100 Areas shoreline to delineate areas of preferential inflow of groundwater to the nearshore environment.

(2) Based on aerial and underwater observations of substrate types (gravel composition/size) known to be used as spawning habitat by the salmon, the substrate pore water samples from the transect yielding the highest chromium levels occurred in gravels that would not be preferred as spawning habitat. The presence of a more predominant silt/sand matrix

within the coarse gravel that contributes to embeddedness (i.e., compaction/concretion) would make the digging of the redds more difficult, would provide less oxygen to the developing salmon, and would be more prone to smothering the developing salmon. Conversely, areas that yielded relatively low levels of chromium have a coarse gravel/cobble complex. Good spawning habitat consists of well aerated, coarse gravel mixed with the cobble.

(3) Seventeen transects along the riverbank at 100-H have been sampled to date, of which two transects (#1 and #4) have shown hexavalent chromium concentrations that are above the U.S. Environmental Protection Agency Ambient Water Quality Criteria of 11 ug/l (concentration defined as protective of aquatic life). The acute toxicity level for juvenile salmon is considerably higher; 200 ug/l has been observed in laboratory tests as the concentration observed to be lethal to 50 percent of the exposed fish. Additionally, although there is evidence of mutagenic activity from hexavalent chromium in mammals, it does not appear that any mutagenic activity has been observed or reported in salmon from exposure to hexavalent chromium (reference: Eisler, R. 1985, "Chromium Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review." Fish and Wildlife Service, U.S. Department of the Interior, Biological Report 85, Contaminant Hazard Reviews Report No. 6 Washington, D.C.).

(4) Treatability tests conducted to date have not shown that chromium removal by pump and treat methods is either effective or efficient in reducing chromium contaminant concentrations in either the unconfined aquifer or in the riverbed gravel environment. Pump and treat testing at 100-D has demonstrated that chromium can be removed from pumped groundwater, but the testing has not demonstrated a measurable improvement to water quality in the unconfined aquifer. This is mostly due to the limited withdrawal capacity of existing wells, and it is considerably less than 500 gpm. Numerous new wells would be required to achieve this capacity.

(5) Chromium removal from groundwater away from the river will not change the exposure to contaminants within salmon redds for some time to come, due to the relative slow movement of groundwater at 100-D (one-half foot per day estimated), so there is virtually nothing that can be done to change the environment for this year's hatching of young salmon.

It is inappropriate to proceed with additional pump and treat systems based on preliminary inconclusive data concerning impacts caused by upwelling chromium contaminated groundwater. The first year cost to design, construct, and operate a 200 gallon/minute pump and treat system, including wells, is approximately $5,700,000. Subsequent operational costs are approximately $800,000/year. The requested capacity of 500 gallons/minute would be somewhat higher. DOE interprets the YIN letter to request installation of such systems, at a higher flow rate, at a minimum of three locations (100-H, 100-D, and 100-K).

River stage control for the purpose of managing the upwelling of groundwater contaminants into the riverbed gravels, as suggested in the letter, may in theory be possible. However, it is probably impractical, considering the competing uses of the river, including managing flows to enhance downstream migration of salmon. In addition, river stage control might help slow the movement of contaminants at the water table, but may not do much to slow movement through the river bed. The hydraulic relationship between the unconfined aquifer and the river is complex and not completely understood; however, current ideas suggest a fairly constant rate of influx of groundwater into the submerged part of the river channel.

Clearly, there is a need to conduct further investigations to understand the exposure of salmon to upwelling of chromium-contaminated groundwater. Sampling will resume in late summer/early fall. DOE will coordinate such studies with the YIN and the studies will be conducted in such a way as to not adversely impact salmon populations. The DOE Richland Operations Office staff attempted on April 7, 1995, to schedule a meeting with the YIN; however, it appears that your travel schedule precludes such a meeting in April 1995. Please contact Mr. K. Michael Thompson at (509) 373-0750 to schedule a meeting at your convenience. Preliminary data, that has been collected to date, will be provided to Mr. F. R. Cook at the Richland, Washington, YIN Office within a week of this letter. RL looks forward to working with the YIN to resolve any issues concerning this subject.

If you want to discuss this matter further or require additional information, please contact Mr. Thompson.

Sincerely,

for

Linda K. McClain, Assistant Manager
for Environmental Restoration

RSD:KMT

cc: F. R. Cook, YIN
D. R. Sherwood, EPA
R. F. Stanley, Ecology