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MEMORANDUM

TO: Dave Bradley, Toxics Cleanup Program, WADOE
WA Department of Ecology

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: January 18, 2012

SUBJECT: Spokane Tribe Of Indians' review of : ***Draft Revisions Sediment Management Standards (SMS) (Part V and Definitions) Discussion Materials Prepared for the Sediment Cleanup Advisory Committee October 2011 original draft November 2011 updated draft includes freshwater standards Prepared by Toxics Cleanup Program***

CC: BJ Kiefer, Director STI-DNR
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Surface water and sediment are fundamental building blocks of the aquatic ecosystem greatly valued and relied upon by the Spokane for sustenance. Contaminated sediment and surface water discharging from Washington State lands flow through our reservation. We are currently involved in cooperative efforts with WADOE to cleanup the Upper Columbia River as wells a contamination associated with releases from upstream sources on the Spokane River and Tshimikian Creek.

I am an author of the Spokane's Tribal Water Quality Standards (2003), Spokane's Tribal Water Quality Standards (2010), and Spokane Hazardous Substances Control Act (2004). I am also an author of the Spokane Tribe's Integrated Resource Management Plan (IRMP) for the Spokane Indian Reservation (2008) and "The Spokane Tribe's Multipathway Subsistence Exposure Scenario and Screening Level RME" (2002). Below are General Comments followed by Specific Comments.

General Comments

1. Definition of risk, definitions of background, and definition of "Contaminated Sediment". Below are two comments excerpted from a recent discussion with EPA on this topic. Please note that in the context of this discussion, MTCA and the NCP can be used interchangeably. We provide these comments hoping that the authors realize the value in defining risk as the "risk attributable to the release(s)" alone. Doing so negates the need to concoct different definitions of background that are scale dependent and subsequently arbitrary. Doing so also enables "harmonization" with MTCA/NCP.

1. The NCP is a regulation that focuses on the cleanup of releases of hazardous substances; therefore, any determination of risk to human or ecological receptors pertains to the incremental risk attributable to the release(s) alone—not risk caused by prerelease conditions such as risk from natural materials or by other exogenous factors.[1,2]*. Below are excerpts from pertinent portions of the NCP. Portions of the excerpts have been emphasized to expedite the argument.*

§ 300.1 Purpose and objectives.

The purpose of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is to provide the organizational structure and procedures for preparing for and responding to ***discharges of oil and releases*** *of hazardous substances, pollutants, and contaminants.*

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§ 300.5 Definitions.

Pollutant or contaminant as defined by section 101(33) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which ***after release into the environment*** *and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or*

[1] The term "risk" is not found in the definitions section of the NCP (40CFR300.5).
[2] The STI Hazardous Substances Control Act (2002) explicitly defines risk as "risk attributable to the release" because the STI realized that in many instances EPA has incorrectly estimated total risk (risk attributable to the release in addition to risk that was already present prior to the release) when the NCP requires estimation of incremental risk alone.

their offspring. The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under section 101(14) (A) through (F) of CERCLA, nor does it include natural gas, liquified natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas). For purposes of the NCP, the term pollutant or contaminant means any pollutant or contaminant that may present an imminent and substantial danger to public health or welfare of the United States.

Release *as defined by section 101(22) of CERCLA,* ***means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant),*** *but excludes: Any release which results in exposure to persons solely within a workplace, with respect to a claim which such persons may assert against the employer of such persons; emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine; release of source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under section 170 of such Act, or, for the purposes of section 104 of CERCLA or any other response action, any release of source, byproduct, or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. 7901 et seq.); and the normal application of fertilizer. For purposes of the NCP, release also means threat of release.*

2. From the discussion above, in order to estimate the risk attributable to the release, EPA must first know the nature and extent of contamination prior to developing estimates of risk, otherwise, the estimates of risk are a mixture of risk attributable to the release and risk attributable to natural or pre-release conditions.

The Goals section (Page 1, para. 2 sentence 2) states:

> ***The first phase of this process is to provide a summary of the level of effort (LOE) expected to delineate and characterize contamination in soils within the UCR basin.***

This statement is consistent with the approach described by the NCP; however, all subsequent actions described in the LOE, focus on sampling to evaluate total risk, rather than the extent of contamination. In other words, it appears that EPA

is looking at sampling to estimate total risk as the first screen or decision point, and if total risk is exceeded, then they will compare sample values to some arbitrary provisional value of background[3,4,5,6].

2. WAC 173-204-571 Sediment cleanup standards based on human health risks.

The Tribe notes that Numerical Standards for the Protection of Human Health are not provided, and suggests this approach be applied as well for standards that are purported protective of ecological receptors. It appears that both the human health and the ecological receptor portions of the regulations has been drafted assuming that site risk derives from a single COC contained in a single medium or pathway. However, our experience tells us that risk for most sites are related to mixtures of COCs in mixed pathways and that similar mixed concentration ratios of COCs are not typically collocated.

Below is a comment excerpted from a recent review of fish consumption rates entitled ***Spokane Tribe Of Indians' review of : Fish Consumption Rates, Technical Support Document A Review of Data and Information About Fish Consumption in Washington, WADOE September 2011***

> 2. *We realize that the document focuses on current FCR, but we believe that the document would be more useful to the public if it qualifies and guides the use of the proposed FCRs in risk assessment. For example, for situations where surface water or sediments exceed natural conditions, it is quite likely that other dietary media (e.g. game, roots, leaves, etc.) also are contaminated. In such instances, dietary pathways other than fish usurp a portion of the allowable risk allocation and surface water or sediment numerical standards based on the FCRs are not protective. Similarly, if mixtures of contaminants*

[3] The approach makes little sense, since some of the natural uncontaminated soils likely exceed EcoSSL/R9PRGs.

[4] The term "background" as used by EPA in this document as well as many of its guidance documents is not equivalent to pre-release conditions, as required by the NCP. Therefore, "background" as described in the LOE cannot be used to evaluate the risk attributable to the release.

[5] This provisional value of background if determined from site data will be an unknown weighted mixture of soils whose parent materials are unspecified and this mixture also will contain contaminated and natural soils. The resulting background cutoff (e.g. UTL95 for the COI population) will be driven by the samples containing the highest COI, which is likely a contaminated sample or a sample that contains high natural levels of the COI, but only represents a very small area or volume of material.

[6] As described in General Comment No. 1, estimate of pre-release conditions is necessary to estimate risk to the receptor that is attributable to the release. Since risk is receptor-specific, the exposure area of a given receptor is defined by his anticipated home-range. This means that "background", although provisional must be determined on the same scale as the home range of the receptor of interest—its not some single value that is spatially independent and sampling and estimation of prerelease conditions is not a simple endeavor as portrayed in the LOE.

are present in a single (or mixed) exposure pathway, tabled numerical standards are not protective and arguably are technically irrelevant. [7]

Absent of guidance on their uses, the Tribe is concerned that freshman risk assessors could misuse this information, much like that which has been done with the EPA 2002 (FCRs have been misused by PRPs as well as EPA). The Tribe believes, the more that these concepts are brought forth and contemplated in regulations and supporting documents, the less likely their misuse will occur. The Tribe plans on promoting these concerns in our review of the Draft WADOE Surface Water Quality Standards and Draft WADOE Sediment Quality Standards.

3. Freshwater Sediment quality standards (SQS) and contaminant screening levels (CSL) [*for the protection of Benthic Receptors*] . Why is there a difference between CSL and SQS? and why are neither of these values fully protective of human health and the environment?

Also, it is not apparent to the reader, until introduction of Table IV, that there is indeed a difference between the two. and is begs the question "why would a PRP not be required to meet SQS?" or site-specific values based on pre-release conditions (as well as risk to human health concerns)?

4. Definition of Regional Background. This definition sets the WAC "high-bar" for cleanup and does not enable WADOE to regulate or cause change to extra-territorial sources. For example, Pb in gasoline in the pre-1980's would fit this definition. Hg, CO_2, etc. from off-shore coal, mining, cement kiln, etc. sources. The **clause " *not primarily attributable to identifiable contaminants from specific sources or releases"*** is open to argument. Any air-discharged COC that ultimately passes through portions of the hydrologic cycle (nearly all of them) could fit this definition.

In other words, as long as everyone else releases contaminants and the source is too complicated for WADOE to discriminate, then "regional background" and health risks and concomitant health costs will rise overtime.[8]

[7] Both Spokane Tribe of Indians Hazardous Substances Control Act December, 2003 (Amended November, 2004) and Spokane's Tribal Water Quality Standards February 25, 2010 Resolution 2010-173 provide guidance for situations where mixtures of contaminants are present in singular or mixed exposure pathways.

[8] Alternatively, if a COC was permitted to be discharged into the environment in the past, such as Hg or As, but today detection levels have decreased and risk concerns have heightened, these permitted discharge would likely fall into the category of "ubiquitous".

5. Definition of Regional Background. Along with the problems described in the previous comments, the definition is subjective, qualitative and results generated by practicing professional would likely differ. Below are discussions on the highlighted portions of definition.

> *(33) "Regional Background"[14] means: Within a department defined geographic area, widespread concentrations of any hazardous substances or toxic, radioactive, biological or deleterious substances in sediment, not primarily attributable to identifiable contaminants from specific sources or releases.*
>
> *Regional background is intended to include low level ubiquitous concentrations of hazardous substances;*
>
> ***Regional background concentrations are generally expected to be greater than or equal to natural background and less than area background as defined in WAC 173-340-200.***

We disagree with this generalization. The calculated value or cut-off of any regionalized population really depends over which areas one is spatially averaging over and the approach or metric employed. Since "regional" connotes larger area, more natural hot-spots of COCs are likely included in the subsample of the areal "population". Since values of background are typically defined as the higher end of the population (e.g. UCL95/UTL95 of the population), the hot-spots will dominate and the "regional" value of background is likely higher. This concern is more greatly enhanced when funds are limited and small numbers of samples are obtained to define background.

> *Calculation of regional background must exclude areas with an **elevated** level of contamination **due to the direct influence** of known or suspected contaminant sources including, but not limited to, areas within a sediment cleanup unit. [Emphasis added]*

See Comment No. 1. Unless explicitly defined, "elevated" and "direct influence" are subjective. The reasoning employed in this definition is circular. Assuming that "elevated" has been defined quantitatively, the geologist/hydrogeologist does not know a priori that areas are "elevated" (i.e. hot-spots) or just a component of the natural variation of natural background (pre-release conditions). Further, it will likely take a large number of samples taken in areas assumed to be outside of the potentially affected area to begin to discriminate an "elevated" population intermixed within natural background.

> *Examples of a geographic area to determine regional background could include, but are not limited to, that portion of an embayment or watershed outside the areas with contamination attributable to one or more specific sources;*
>
> *If a waterbody is not **beyond the direct influence** of a significant source, the department shall approve alternative geographic approaches to determine*

regional background. Several factors must be evaluated when determining an alternate geographic approach including:

(a) Proximity to the site;
(b) Similar geologic origins;
(c) Similar fate and transport and biological activities; and
(d) Chemical similarity." [Emphasis added]

6. Definition of Sediment Quality Standard

> *(39) "Sediment quality standard "means chemical concentration criteria, biological effects criteria or other toxic, radioactive, biological, or deleterious substances criteria, and non anthropogenically affected sediment quality criteria which are used to identify sediments that have no adverse effects on biological resources per procedures in WAC 173-204-320 and 173-195 204-573*

Please explain how frank affects described in Table VIII are used to calculate or estimate "*no adverse effects*". Is a factor of safety employed? If so please explain.

Specific Comments

1. Page 34, Line 122: Definition of natural resources and ~~ecology~~ habitat

Suggest stet. Habitat is not defined in this document and is generally qualified by receptor (e.g. goose habitat). If habitat remains, then it should include all natural human interactions with the environment such as hunting, gathering, and fishing uses.

2. Page 40, Line 51:

> *(e) Consideration of natural background and analytical limits. Sediment cleanup standards developed under subsection (2) of this section shall not be established at concentrations below natural background concentrations or the practical quantitation limit,* ***whichever is higher***[91].

[91] *Substantive change. This incorporates the MTCA framework of establishing a cleanup standard that is the highest of a human health risk level, background, or practical quantitation limits.*

The reasoning here also is circular. How does one know that the value of *natural background* if the value is already below PQL? Have method detection limits (MDL) been used in the past to set background?

This *whichever is higher*[91] clause is troublesome. For example, Human-health based RAO for deemed protective of the general public would likely not be protective of ecological receptors.

3. Page 43, Line 48:

> (a) Sediment concentrations that correspond to no significant human health risk shall be based on estimates of the reasonable maximum exposures expected to occur under both current and future site use conditions.

RME for current uses, like canvassing for fish consumption rate for current populations, employs circular reasoning. An RME for current and Reasonable foreseeable future land uses, ***but for the release*** must be developed. Otherwise, WADOE would only cleanup to current conditions (which are by definition not "clean") or remediate industrial areas to be industrial areas.

> For sites located within a tribal usual and accustomed fishing area, the reasonable maximum exposure scenario shall be based on tribal fish consumption rates. The department has developed a statewide default fish consumption rate of XXX g/day. The department may approve a site specific fish consumption rate.

Exactly how will SQS employ fish consumption rates as well as water consumption uses (including sweat lodge) in calculation of SQS? Also these HHR-based SQS will likely be lower than benthos-based SQC, if Tribal exposure factors are employed. Again, we are not sure which regulations and supporting guidance documents attempt to resolve all of these issues; however, we applaud WADOE for not publishing tabulated numerical standards for protection of HH and we recommend the same be done for protection of benthic receptors (See General Comment no. 2).

4. Page 51; entire section: WAC 173-204-573 Cleanup screening levels and sediment quality standards based on benthic community toxicity in freshwater sediment.

Note that the tabled numeric values apply to protection of benthos only and does not include mixtures or mixed pathways (they model an unrealistic or very narrowly defined situation rarely observed in the field.) They also do not protect for fish then humans via up-chain transfer. Using these tabled values as screening levels to "screen-out" COCs is

not protective. As before, the Tribe recommends deleting all numerical standards since they will likely continue to be miss-used.

5. Page 53, Line 23:

> *"Chemical concentrations above the cleanup screening level correspond to sediment quality that results* ***in minor adverse effects to the benthic community.*** *The freshwater chemical and biological cleanup screening levels establish* ***minor adverse effects****…".*

The Tribe strongly disagrees with this characterization. General Comment No. 5 concludes that frank affects observed when exposing receptors to a single COC are employed to determine these numerical values. The Tribe also points out that these receptors undergo rapid selection (in comparison to human life) in response to stressors since their lifecycle is very short duration. Even small seemingly "minor effects" (e.g. 15% apparent effects portrayed in Table VII for SQS) could be responsible for large shifts in population characteristics over a greater time-frame. In summary, the thresholds depicted in Table VIII, likely are not protective.

6. Page 55, Table VI

The Spokane Tribe of Indians Hazardous Substances Control Act (STI, 2004) relies on MacDonald 2000 for estimation of TECs and PECs when a single COC dominates a single pathway. Comparison of a handful of COCs of the STI (2004) freshwater sediment standards and the proposed tabled values are provided below:

	Ratio (WADOE/MESL)			
	SQS/TEC	SQS/PEC	CSL/TEC	CSL/PEC
As	1.43	0.42	12.26	3.64
Cd	2.12	0.42	5.45	1.08
Cr	1.66	14.46	1.89	16.47
Cu	12.66	2.68	37.97	8.05
Pb	10.06	2.81	89.39	25.00
Hg	3.67	0.62	4.44	0.75
Zn	26.45	6.97	34.71	9.15

The differences are quite substantial. Evidently the databases relied upon by WADOE on contain theses COCs in forms that are not as thermodynamically effective (bioavailable) as those relied upon by MacDonald 2000, or the methods in determining thresholds are quite different. Regardless, this large difference demonstrates that freshwater sediment standards are subjective. Again this argues for removing all of these tabled values.

7. Page 60, Line 24:

> *(3) Minimum requirements for sediment cleanup actions. These requirements and the requirements for consideration of the cleanup standard under WAC 173-204-570 shall be considered concurrently. All cleanup actions conducted under this chapter shall meet the following requirements:*
>
> ***(a) Protect*** *human health* ***and the environment; …*** [Emphasis added]

In light of the previous comments on CSL; how do CSLs meet these criteria?

References Cited

Harper, B.L. , Flett, B. , Harris, S., Abeyta, C., and Kirschner, F.E., 2002, "The Spokane Tribe's Multipathway Subsistence Exposure Scenario and Screening Level RME." *Risk Analysis*, Vol 22, No. 3, pages 513-526.

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STI, 2010, Spokane's Tribal Water Quality Standards February 25, 2010 Resolution 2010-173 (02/25/2010--SLOC CH. 30--Res. No. 2010-173)

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