

Comments Received in Response to
Ecology's Fish Consumption Rates Technical
Support Document, A Review of Data and
Information About Fish Consumption in
Washington, Version 1

Received thru January 18, 2012

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From: [Larry Dunn](#)
To: [ECY RE Fish Consumption](#)
Subject: comments on fishconsumption
Date: Monday, October 10, 2011 11:27:30 AM

COMMENTS ON THE DEFAULT FISH CONSUMPTION RATE ISSUE:

Under the Preliminary recommendation section it should be noted that the 157 to 267 gram per day rate is not protective of most of the Salish tribes. Therefore individual tribal rates should be considered and will be necessary in many cases.

it needs to remain clear that this rate is not to be construed as a tribal default rate. If it becomes the water quality rate then it will be the default for all water quality programs, is that correct? If it is then I think that it should be clearly stated as such.

Page 77 there is a reference to the EPA recommendations to states it appears that the options range is all over the place but I think that the Suquamish rate as the highest average rate is the most appropriate to use when setting the standards. Using the lowest recommended standard of the mean it will give a 214 grams per day number which is protective of all non-native consumers and some native consumers to the 85% or better, though 267 would be protective of most groups to the 90% which is the standard percentile used for MTCA.

Just a comment on the current EPA water quality rates, they are based on data from the 1990's and are not consistent with the current knowledge of tribal consumption.

The diet fraction from the site should be based upon how much fish **could be acquired** from the restored site or 100% as default.

Exposure duration should be 70 years tribal members don't leave their U&A and most don't move far from the reservation due to service availability. Many Northwest people stay in the northwest most of their lives, even expatriates tend to return eventually.

Body weight is another problematic issue since the average body weight of an adult in the US has gone up considerably in recent years. According to the reports published by the Centers for Disease Control and Prevention (CDC), average [body mass index](#) BMI, has increased among American adults from approximately 25 in 1960 to 28 in 2002. BMI is a weight-for-height formula used to measure [obesity](#). Study reports show that the average American man's (20-74 years old) height has increased from 5'8" to 5'9½", while the average height of an American woman of the same age has increased from 5'3" to 5'4". But in the meantime, average American male weight (aged 20-74 years) has increased dramatically from 166.3 pounds to 191 pounds and the average American female weight (of the same age) has increased from 140.2 pounds to 164.3 pounds.

The high end of your recommendations (267 g/day) is the most appropriate default number particularly for cleanups and based upon the recent studies of salmon the water quality

program as well. It should be noted on page 105 bullet #4 that ... default fish Consumption rate in the proposed range would be protective of “**most**” fish consumers.

On the question of whether to include salmon I think that you should cite the two studies which indicate that the salmon pick up their body burden in the rivers and streams as a counter to the widely held belief that salmon pick up their body burden in the open ocean (a conclusion which is illogical). I would hope that those would change the conclusion on page 108 “ A significant part of salmon contamination occurs in waters and from sources outside of individual MTCA sites or the waters regulated under the CWA-based criteria.” This conclusion is based upon studies which did not collect salmon at sea and are based upon assumptions of life cycle which are questionable, since not all species of salmon spend the same amount of time at sea in fact some(sockeye) spend very little time at sea and most spend a year or more in the streams, rivers and estuaries.

These two newer studies were well done and I believe are of sufficient value to at least counter the accepted assumption that the contamination is from the open ocean. The science is there to support the assumption that salmon get their contamination in the stream, rivers and embayments of Puget Sound, therefore I would recommend that either these studies be cited to show the difficulty or be used as a basis for including salmon in the fish consumption. (NOAA 3/18/2008 Technical study/ Laliberte 2006)

Generally the report is excellent. Sincerely, Larry Dunn, LEKT

From: PWendling@cob.org
To: [ECY RE Fish Consumption](#)
Subject: Comments on fish consumption by Washington residents
Date: Tuesday, October 11, 2011 3:33:28 PM

To Department of Ecology:

I applaud your work to keep Washington a healthy place to live. I wanted to submit a comment on the process the Department of Ecology (Agency) is undertaking to assess fish consumption risks to human health in the state of Washington. My comment is directed at the observation made on the Agency's website at <http://www.ecy.wa.gov/toxics/fish.html>. The statement is made on this site that "[i]n fact, we consume fish and shellfish in amounts that are much larger than the state's current rates reflect".

While this statement is likely be true, it is our hope that the Agency collects data to sufficiently determine the amount of fish and shellfish consumed in Washington that originate from Washington waters. The City of Bellingham once had a thriving commercial fishing community. At that time it may have been a safe assumption that Washington residents ate fish that originated in our state's waterways. The commercial fishery in Bellingham Bay and surrounding areas has been significantly reduced

over the course of the past two decades. In fact, the arrival of Alaska salmon to our grocery stores is heralded in local marketing campaigns.

It is our hope that the Agency will conduct a comprehensive survey of the citizenry of our state to accurately assess not only fish consumption levels but also to assess the amount of seafood available and consumed in Washington that originate in Washington. Washington's recreational fishers should also be surveyed to assess the amount of fish and shellfish that are consumed by these individuals and their families . Assumptions of 100% consumption of recreational catch by these fishers should not be made unless it is substantiated by good survey data.

It is likely that the Agency already has plans in place to ensure that its health risk assessment data is derived utilizing accurate consumption information on state residents. If so, I appreciate your efforts to do this. If not, toxicologic data derived from assumptions that are not accurate would likely result in higher costs to Washington residents to obtain a regulatory end-point that is not likely to improve health outcomes.

Thank you for your consideration.

Peg Wendling
City of Bellingham
Department of Public Works

From: [Talitha Thalya](#)
To: [ECY RE Fish Consumption](#)
Subject: Hope for changes
Date: Tuesday, October 11, 2011 4:52:07 PM

I would like to see the chemicals listed below banned from our state.... the data has been out a long time . Regulating keeps the door open for its harmful use, only banning its use and removing it from store shelves will keep our food safe. A little harm is too much.

Thanks

Talitha Thalya

Diazinon, carbaryl, Atrazine and Lindane exceeded U.S. Environmental Protection Agency (US EPA) and other chronic aquatic-life criteria.

Diazinon, 2,4-D, and MCPP are the most frequently purchased pesticides.

- **carbaryl**, marketed as **Sevin** and used in flea treatments and lawn care, control pests on fruit trees, vegetable crops, cut flowers, turf and in oyster beds among other things; The EPA estimates about 1.4 million pounds are used each year to .
- **Atrazine** Atrazine is used to kill both broadleaf and grassy weeds. It is the second most widely used herbicide in the United States, after glyphosate. .. Atrazine potent disruptor of endocrine hormones, such as estrogen and testosterone - in fish, amphibians, birds, reptiles, laboratory rodents and even human cell lines at levels of parts per billion. Recent studies also found a possible link between human birth defects and low birth weight and atrazine exposure in the womb. research has found that "atrazine induces infertility, prostate cancer and breast cancer in rats and is associated with these diseases in humans in several published studies." "Some 80 million pounds of the herbicide atrazine are applied annually in the United States on corn and sorghum to control weeds and increase crop yield, but such widespread use also makes atrazine the most common pesticide contaminant of ground and surface water,
Male frogs are made into both male and female ... **Its the number one contaminate of our water supply across the nation.**
Seven EU countries in the European Union ("EU") have banned atrazine in 2004 : France, Sweden, Denmark, Finland, Germany, Austria and Italy. These countries have a policy of banning pesticides that occur in drinking water at levels higher than 0.1 parts per billion.
- Diazinon was frequently detected in urban streams tested in the Puget Sound region in concentrations that exceed guidelines for protecting aquatic life. This dangerous insecticide has recently been phased out of certain uses by the EPA because of its harmful effects. One senior scientist at NOAA has reported that certain pesticides are among the "contaminants of concern" that can **impact salmon survival. Many pesticides can harm fish, even in very small amounts.**
- **Lindane**
- **MCPP**
- Mecoprop Trade names include Kilprop, Mecopar, Triester-II, Mecomin-D, Triamine-II (with MCPA and 2,4-DP), Triplet (with 2,4-D and dicamba), TriPower (with MCPA and dicamba), Trimec (with 2,4-D and dicamba), Trimec-Encore (with MCPA and dicamba), and U46 KV Fluid . . . /The duration of mecoprop's residual activity in soil is about two months. Adsorption of mecoprop increases with an increase in organic matter in the soil. Unaged MCPP and its salt forms are very mobile in a variety of soils (3). Because of this high mobility, it may potentially leach into groundwater (6). However, in general, phenoxy herbicides such as MCPP are not sufficiently persistent to reach groundwater (6).
- m-chlorophenylpiperazine (**mCPP**) is a serotonin agonist that binds to serotonin Journal of Architectural **Engineering**, 2, No. 2 (1996) 78-79

- **2,4-D**
- **carbofuran**, marketed as **Furadan**, and About 1 million pounds is used on corn, alfalfa and potatoes.
- **methomyl**, sold under brand names including **Lannate and Bug Master**used on vegetable and orchard crops, livestock quarters and garbage containers.
- **“Weed and feed”** contains some of the most harmful chemicals to **bees, fish and aquatic life**
- malathion
- chlorpyrifos

Carbaryl is **banned** in Austria for all uses.

Studies there have shown mutagenic and ... that aquatic **carbaryl** levels **not** exceed 0.02 parts per billion. ...

malathion, diazinon and chlorpyrifos. The fisheries services recommended buffer. The fisheries agency and EPA are reviewing a total of 37 pesticides under terms of the settlement of the lawsuits brought by

Northwest Coalition for Alternatives to Pesticides NCAP -**Aimee Code**, wt quality coordinator/ Ph. [541-344-5044](tel:541-344-5044) / info@pesticide.org /

<http://www.pesticide.org/UrbanPesticidesChart.html>

<http://www.pesticide.org/>

A couple of years ago, the Department of Ecology found that stormwater annually washed between **6.3 and 8 million gallons of petroleum products into Puget Sound**, equivalent to an *Exxon Valdez* spill every couple of years.

From: [Brian Crossley](#)
To: [ECY RE Fish Consumption](#)
Cc: ["BJ Kieffer"](#)
Subject: fish consumption level
Date: Wednesday, October 12, 2011 10:01:13 AM

The Spokane Tribe of Indians adopted an 86.3 g/day fish consumption rate in our first EPA approved standards. Although this rate was much less than the actual fish consumption level, EPA had designated that amount for subsistence populations at that time. The Tribe has since adopted 865 g/day which is reflective of the historic fish consumption level and is awaiting EPA approval. Oregon recently adopted a higher fish consumption rate to better reflect the amount consumed. Many tribal members live outside of the Reservation but still consume much more than 6.5 g/day of fish. The Tribal standards do not directly apply to the waters outside of the Reservation therefore they may not be protected under such a low fish consumption value. The State standards should consider the tribal community when developing a new fish consumption level. The Clean Water Act clearly identifies the most stringent standards apply between states/tribes and therefore the standards should be conservative enough to protect the higher fish consumers.

Brian Crossley
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509-626-4409

From: [Susan Mac](#)
To: [ECY RE Fish Consumption](#)
Subject: interesting
Date: Thursday, October 13, 2011 2:10:39 PM

I Like the idea of less toxins in the water, but as long as you as an agency refuse to monitor the industrial shell fish corporations and there massive amounts of plastics and carbaryl I can't really take you seriously.

I find it terribly sad that the very agencies that are meant to protect us are only industry tools.

Susan Macomson

From: [John Shaw](#)
To: [ECY RE Fish Consumption](#)
Subject: Fish consumption
Date: Thursday, October 20, 2011 12:42:44 PM

Adopt the new Oregon rules, 175 grams.

1. Great job describing the issues. The additional material on the CDI is very helpful.
2. Your reasoning for not using the National CSFII data could be more detailed.
3. Are Lon K & Leslie K comfortable with referencing their draft paper?

Executive summary

- Before introducing the issue of salmon it is important to add a discussion of anadromous, marine, estuarine, and fresh water species.
- Define “high fish consumers” This is a value statement that should either be defined by ecology or based on definitions in the surveys you reviewed. See specific comment no. 6.
- Define “statewide default” fish consumption rates. Does this refer to specific laws, actions, advisories, etc. It would be helpful to declare in the Executive summary what policies, programs; rules may be affected by this “default” rate.
- Pg. 7 “...those individuals that eat a lot of fish...”
What does “a lot” mean?

Chapter 1.

1. Pg 9. “US EPA in the 1980’s”. You should include the actual references.
2. Pg 9-10 Key considerations “Treaty-reserved fishing rights”. You should include this list of bullets in the Executive Summary. In particular there is no discussion of treaty rights in the executive summary.

Chapter 2

3. You use different terms for fish & shellfish. You may need to clarify your groupings at some point groupings by anatomy eg finfish & shellfish and groupings by habitat eg anadromous, marine, etc. You mention eggs here but I am not sure if you discuss them further in the document.
4. Pg 16. “See Appendix B for information on fish & shellfish species harvested...” There information is not in Appendix B.
5. Pg 17. Define your geographic boundaries “lower south sound”, etc
6. Pg 17. “Salmon is not considered in many risk assessments...” Be more specific MTCA, EPA, can you give references?
7. Pg 23. Do you have more information on the DOW report. The methodology is not clear nor is the size of the population surveyed.
8. Pg. 24 “... high fish consumers are...” This should be included in the Executive Summary.
9. Pg 24. Footnote 29 on pg 25 should be included with this paragraph. However, later in the report you discount the use of only fish consumer data because of the method of data collection.

10. Pg 25. Need more information on Table 6. Where does 28% come from, etc
11. Pg 28. Footnote 49 “National fish consumption studies are typically carried out over a broad...” What studies are you referring to? The USDA study? I think this is a very important and potentially controversial statement. It should be more than a footnote.
12. Pg 29. “Ecology concludes....significant amount likely coming from local sources.” Do you have a reference for this statement or evidence to support this?

Chapter 3

13. Pg 39. Define “subpopulation”
14. Pg. 42 What about the value of qualitative vs quantitative surveys.
15. Pg 45 “Most fish dietary surveys...” This is a rather broad statement. Do you mean the surveys you reviewed or all surveys for all places beyond the PNW?
16. Pg. 45 “using independent statisticians...may circumvent..” Are you suggesting this is OK?

Chapter 4

17. Pg 48. Your reason for eliminating the Harper & Harris reports needs to be expanded. .
18. Pg 49. “It is possible that tribal elders ...were omitted...” Do you have evidence of this or is this simply your observation from reviewing the report?
19. Pg 51. I am somewhat confused. You describe an elegant list of design criteria, yet you don’t use them to evaluate the appropriateness of the reports. Were the design criteria from Ellen Ebert on Pg 40 simply for illustration purposes?
20. Pg 51. Note that the CRITFC survey did not include body weight. It is a limitation of the data comparisons that you purpose in your CDI.
21. Pg 60. Lon did a lot of extrapolation of the API data. I think this should be noted as a weakness of the data; particularly when including it in the CDI
22. Pg 65. “...using a consumption rate derived from a low percentile of the consumption distribution would not accurately estimate contaminant exposure...: This is a particularly important point. You use the consumer only population from the USDA national survey to characterize the proportion of high fish consumers in Washington, right? Does this mean it is not “an accurate estimate”. Also, the Native American and Pacific Islander surveys are only representative of a small proportion of the Washington population. Are the consumption rates derived from these populations an “accurate estimate” of the Washington consumers?
23. Pg 69. Does EPA 2001 include a discussion the CSFII methodology? The CSFII was an USDA study not an EPA survey.

From: [David Mayfield](#)
To: [ECY RE Fish Consumption](#)
Subject: Statewide Fish Surveys
Date: Thursday, November 10, 2011 6:06:18 AM
Attachments: [Mayfield et al. 2007-Fish.pdf](#)

Did WA DOE consider providing estimates for the general population as well as high-end consumers. Several relevant surveys have been conducted which should be incorporated into your assessment. In addition, EPA just released it's revised Exposure Factors Handbook which should be cross-referenced here.

Please see:

Results of a human used survey for shoreline areas of lake union, lake Washington, and lake sammammish

<http://your.kingcounty.gov/dnrp/library/2006/kcr1967.pdf>

Survey of fish consumption patterns of King County (Washington)
recreational anglers (attached)

Exposure Factors Handbook 2011 Edition (Final)

<http://cfpub.epa.gov/ncea/risk/recorddisplay.cfm?deid=236252>

Thank you for your consideration.

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Survey of fish consumption patterns of King County (Washington) recreational anglers

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Three fish consumption surveys were conducted in King County, WA during 1997–2003. These surveys were conducted to support environmental analyses of proposed capital improvement projects planned by the King County Department of Natural Resources and Parks. Personal interviews were conducted at marine, estuarine, and freshwater locations throughout King County. Over 1300 anglers participated in the survey and provided consumption information. A majority of the respondents from the surveys (30–71%) were Caucasian, while the remaining respondents comprised various ethnic groups. The mean consumption rates for consumers of marine fish, shellfish, and freshwater fish were 53, 25, and 10 g/day, respectively. Results indicate that the consumption patterns of marine anglers from King County have remained consistent since the mid-1980s. The consumption distribution for marine anglers suggests that some respondents may consume fish as a large portion of their diet. The consumption habits of freshwater anglers are comparable to those of other recreational anglers throughout the United States. The survey results provide distributions of marine and freshwater fish consumption suitable for risk assessments conducted for anglers residing in King County, WA.

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Keywords: risk assessment, exposure assessment, fish consumption

Introduction

Governmental agencies must continually develop environmentally safe capital improvement projects to sustain the infrastructure of growing urban areas. Common projects can include the expansion of roads and utility services (e.g., water, sewer, and electricity) or construction of new public use areas. In addition to providing improved services, regulatory agencies must consider the consequences of proposed land use plans on public health as part of required environmental studies. This may include an assessment of public health risks from physical, chemical, or biological alterations in the environment (i.e., through the risk assessment process).

The King County Department of Natural Resources and Parks, Wastewater Treatment Division has engaged in a number capital improvement projects over the past decade. During the planning and design phases of its projects, the Department of Natural Resources and Parks conducted a number of surveys of public use areas to gather information

on the recreational patterns of King County residents. The surveys were designed to establish patterns of exposure for use in site-specific risk assessments. In addition to describing recreational patterns of exposure (data not presented herein), the surveys examined the potential for exposure to contaminants through consumption of locally caught fish and shellfish. While there is available information on national fish consumption patterns, the United States Environmental Protection Agency (US EPA) recommends the use of site-specific consumption information over default assumptions based on national studies (US EPA, 1999, 2000, 2002).

Several fish consumption studies have been conducted in Washington State (Pierce et al., 1981; Landolt et al., 1985, 1987; McCallum, 1985; CRITFC, 1994; Toy et al., 1996; WA DOH, 1997, 2001; Suquamish Tribe, 2000; Sechena et al., 2003). However, studies that focused on the general population of marine anglers were conducted over 15 years ago (Pierce et al., 1981; Landolt et al., 1985, 1987; McCallum, 1985). Surveys of freshwater anglers in Washington state were conducted at locations outside of the project area (i.e., King County, WA, USA) (CRITFC, 1994; WA DOH, 1997, 2001). More recent studies have focused only on populations with high (i.e., subsistence) consumption patterns (CRITFC, 1994; Toy et al., 1996; Suquamish Tribe, 2000; Sechena et al., 2003). Thus, the purpose of the surveys conducted by the Department of Natural Resources and

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Parks was to update existing information on the consumption patterns of the general population of marine anglers in King County. Freshwater anglers in King County have not been examined in any previous investigation; thus, the results presented here define consumption rates for a population that has not been adequately described.

This paper details the results from three recreational fish consumption surveys conducted in King County during 1997–2003. Information on the patterns of anglers interviewed at marine, estuarine, and freshwater locations are summarized. These include fishing frequency, species caught, and consumption preferences. Distributions of consumption rates of fish and shellfish are quantified in grams per day for each of the surveys. Finally, the results are compared to other local and national consumption surveys.

Methods

Three consumption surveys were conducted over varying years and locations throughout King County, Washington (Figure 1). The first survey was conducted during a 10-week period from June 1997 to August 1997. The locations of this survey included marine and estuarine public parks and boat launches throughout Elliott Bay and the Duwamish River (Figure 1). The Duwamish River is an estuary that discharges into Elliott Bay and is subject to marine tidal influences. Anglers from this section of the Duwamish River primarily caught marine species; thus, these locations are treated as marine locations rather than freshwater. The results of this survey were reported previously by Simmonds et al. (1998); however, a detailed analysis of fish and shellfish consumption rates was not performed in this report. Thus, the methods and results presented herein provide a more detailed re-analysis of the original data. The second survey (North King County) was conducted over 1-year from March 2001 to March 2002. This survey focused on marine locations throughout North King County and Snohomish County. The third survey was conducted at freshwater locations around Lake Sammamish, Lake Washington, and Lake Union from June 2002 to May 2003. The North King County and King County Lakes surveys were each coupled with an additional survey that focused on sand and water contact activities (data not presented). The personal interview design and survey questionnaires were developed in accordance with US EPA guidance for conducting fish consumption surveys (US EPA, 1992, 1998).

Survey Design and Surveyor Training

The survey design and surveyor training was consistent between the three surveys with minor differences. The Elliott Bay and Duwamish River surveys were performed over 10 weeks on Saturdays and Sundays and 10 (randomly selected)

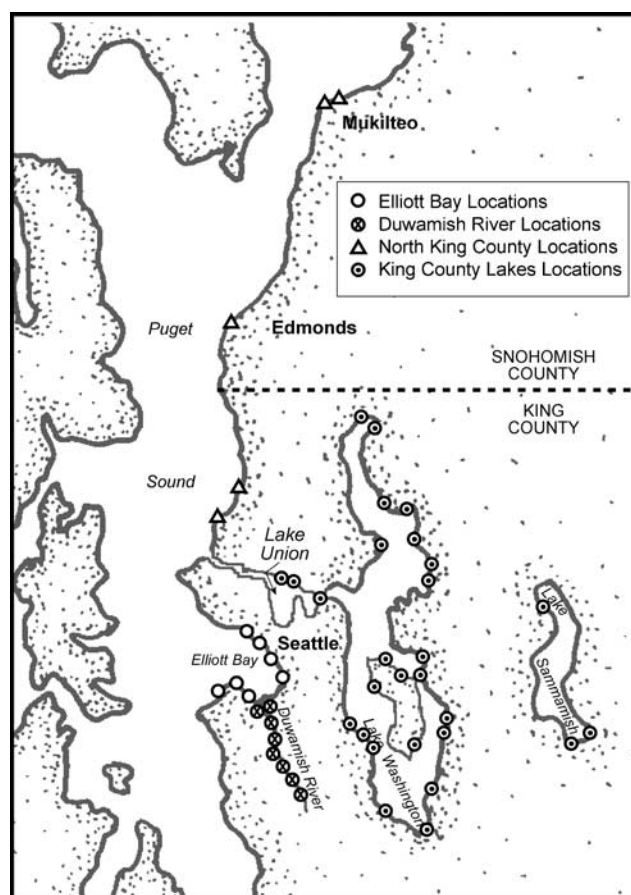


Figure 1. Survey locations.

weekdays. Locations were visited randomly between the hours of 0500–2200 hours. The locations of the survey included public parks and popular fishing areas throughout the project area. Each location was visited at least twice a day (a.m. and p.m.).

The North King County and King County Lakes surveys followed a stratified random design and were conducted over a period of 1 year. The locations of the surveys included marine and freshwater public parks and boat launches throughout King County and part of Snohomish County, WA, USA. Locations were visited randomly during open hours, typically between 0700 to 2000. The locations were visited on both weekdays and weekends throughout the year. Surveyors attempted to interview as many anglers and recreational users as possible within a 1-h site visit. The interview process typically required 5–10 min to complete. Before the start of all surveys, the surveyors were trained on how to fill out the forms and how to approach potential respondents. To avoid introducing bias, the surveyors wore no identifying caps or badges and did not mention any of the intended capital improvement projects planned throughout King County.

Survey Instrument

A survey questionnaire was designed for each of the three surveys to gather information on fishing frequency and consumption preferences. The two-page questionnaire included questions for respondent demographics, fishing location preferences, fishing frequency, consumption rates, preferred species, and preferred cooking methods. Specifically, the forms included questions to record the age, sex, and ethnicity of the respondents. Frequency-specific questions sought information on the typical number of hours and number of days spent at survey locations. In addition, questions designed to estimate the frequency (days/year) of visiting King County specific locations were included. Consumption-specific questions included noting the type of fish typically collected (fish or shellfish), the intended use of catch (e.g., consume, catch, and release), and cooking preferences (e.g., grilled, boiled, broiled). In addition, it was noted if the respondent's family included children, approximate age of the children, and whether they also consume the respondent's catch. Finally, surveyors were instructed to weigh (with a hand held scale) any fish or shellfish that had been caught during the time of the interview. Respondents typically did not have a catch to weigh or refused to have their catch weighed. Thus, limited data on actual harvested weights was obtained from these surveys.

Calculation of Consumption

In order to compare the results from surveyed marine sites to previous studies conducted in or near King County, the method for calculation of fish and shellfish consumption (i.e., the harvest method) was adopted (Puffer et al., 1981; Landolt et al., 1985, 1987; US EPA, 1988). This method provides estimates of consumption by combining information on fishing frequency and the weight of fish caught during the time of the interview. The equation for fish and shellfish consumption is:

$$\text{consumption rate (g/day)} = (\text{FF} \times \text{W} \times \text{CF}) / (\text{NF} \times \text{AT})$$

where FF is the frequency of fishing (days/year); W the total weight of catch (grams/catch); CF the cleaning factor (0.3 for all fish, 0.49 for all shellfish); NF the number in family consuming catch; and AT the averaging time (365 days/year).

The frequency of fishing for the Elliott Bay, Duwamish River, and North King County surveys was based upon the respondents estimated number of days spent fishing per year. Due to the limited number of fish actually measured during the time of the interviews, a mean value for total weight was used in the consumption equation. The uncleaned mean (median) weights for fish and shellfish caught by anglers interviewed at Elliott Bay were 1574 (680) and 1053 (500) g/catch, respectively. The uncleaned mean (median) weights for fish and shellfish caught by anglers interviewed at Duwamish River sites were 544 (327) and 821 (612) g/catch,

respectively. The mean (median) weights for fish and shellfish caught by anglers interviewed in North King County were 1035 (454) and 683 (454) g/catch, respectively. Use of the mean weights provided consumption rate estimates comparable to those estimated from other surveys using this methodology (Puffer et al., 1981; Landolt et al., 1985, 1987; US EPA, 1988). The cleaning factors were the same as those used by Landolt et al. (1985, 1987). The number of consumers in the family was either one for individuals or the number in the family reported by the respondent. The North King County survey did not query for the number of consumers in the family; thus, an average value for family size of 2.5 was used for this parameter, which is an average derived from other studies of recreational fish consumption (Puffer et al., 1981; West et al., 1989; US EPA, 1999).

The consumption rate for the King County Lakes survey was conducted by an alternative calculation method. During this survey, the respondent was presented with visual representations of fish fillets of varying meal sizes (6, 8, 10, and 12 ounce fillets). The respondent was asked to estimate their typical meal size from the visual aid and how often they had consumed fish they caught from the lakes in the previous month. Surveyors also asked the respondent to provide the same information for any children (i.e., <18 years) who also consumed their catch. Thus, an estimate of fish consumption could be estimated for both adults and children. The calculation method relies on the estimated meal size based on the visual aid combined with the number of self-caught fish meals the respondent recalled eating in the past month. This method has been used successfully in a number of consumption surveys (West et al., 1989, 1993; Meredith and Malvestuto, 1996; Scheaffer et al., 1999; Williams et al., 2000). The equation to estimate the consumption rate is:

$$\text{consumption rate (g/day)} = (\text{MF} \times \text{MS} \times \text{CF}) / \text{AT}$$

where MF is the meal frequency of self-caught fish (meals/month); MS the meal size (ounces); CF the conversion factor (28.35 g/ounce); and AT the averaging time (30 days/month).

Data Analysis

The completed survey forms were coded and entered into an electronic database (Microsoft Excel[®]2000) to allow for data analysis. Each of the data sets was analyzed independently; however, an additional analysis of consumption rates using combined data from both the Elliott Bay/Duwamish River and North King County Surveys was also undertaken. The arithmetic mean, standard deviation, standard error, and percentiles were calculated and are presented in tables throughout this article. In some cases, data were not recorded (i.e., due to surveyor error) or was not provided by the respondents; therefore, the sample sizes may vary in the tables provided in the following sections.

Results

Demographics

Over 2400 individuals were approached during the shoreline surveys. A total of 152, 807, 228, and 212 unique individuals agreed to be interviewed at the Duwamish River, Elliott Bay, North King County, and King County Lakes locations (Table 1), respectively. The response rate of non-repeat contacts ranged from 48–93%. The results presented in the following sections and tables represent information from unique (i.e., non-repeat) respondents. Respondents were predominantly male (84–88%) and greater than 15 years of age (>80%). The age of respondents was recorded differently between the surveys (Table 1). The Duwamish River/Elliott Bay surveys asked the respondents to choose an age category rather than report their specific age. The ethnic background of respondents also varied by survey location; however, the majority of the respondents were either Caucasian (30–71%) or Asian and Pacific Islander (12–43%).

Fishing Preferences

The descriptive statistics for frequency of fishing at all four survey areas are presented in Table 2. Respondents' visitation

rates varied throughout the different survey locations. The mean (median) fishing frequency ranged from 16 to 54 (4–28) days/year. Anglers in King County primarily sought to catch fin-fish (Table 3). Respondents at marine and estuarine locations intended to catch only fish (77–89%), while some respondents intended to catch only shellfish (3–17%) (i.e., crabs, shrimp, and mollusks). Most anglers at freshwater locations only intended to catch fish (99%), while a few respondents (<2%) indicated that they intended to catch crayfish.

The species actually caught and identified during the interviews was limited and varied by survey location (Table 4). The species caught at Duwamish River locations by most anglers and in the largest quantities included herring and crabs. The species caught with the highest frequency at marine locations (Elliot Bay and North King County) included sea perch, sole, salmon, crabs, and shrimp. Other species infrequently caught by anglers at estuarine or marine locations during the survey included flounder, rockfish, sculpin, and lingcod. At freshwater locations, the largest quantities of fish caught included perch, trout, salmon, bass, and bullhead. No crayfish were identified during the surveys.

Table 1. Respondent demographics.

Category	Duwamish River	Elliott Bay	North King County	King County Lakes
Water body type	Estuarine	Marine	Marine	Freshwater
Year(s) of study	1997	1997	2001–2002	2002–2003
Interview attempts	250	1697	245	260
Agree (non-repeat contact) ^a	152 (61%)	807 (48%)	228 (93%)	212 (82%)
Agree (repeat contact)	8 (3%)	124 (7%)	4 (2%)	4 (2%)
Disagree (non-repeat contact)	59 (24%)	165 (10%)	2 (<1%)	36 (14%)
Disagree (repeat contact)	31 (12%)	598 (35%)	11 (5%)	8 (3%)
Missing data	0 (0%)	3 (<1%)	0 (0%)	0 (0%)
Gender ^a				
Male	127 (84%)	706 (88%)	193 (85%)	186 (88%)
Female	13 (8%)	68 (8%)	34 (15%)	24 (11%)
Missing data	12 (8%)	33 (4%)	1 (<1%)	2 (<1%)
Age ^a				
≤15 years old	14 (9%)	52 (6%)	—	—
>15 years old	134 (88)	750 (93%)	—	—
≤18 years old	—	—	35 (15%)	30 (14%)
>18 years old	—	—	191 (84%)	175 (83%)
Missing data	4 (<3%)	5 (<1%)	2 (<1%)	7 (3%)
Ethnicity ^a				
Caucasian	46 (30%)	374 (46%)	133 (58%)	150 (71%)
African American	17 (11%)	85 (11%)	8 (4%)	16 (8%)
Asian & Pacific islander	65 (43%)	246 (30%)	56 (25%)	25 (12%)
Hispanic/Latino	6 (4%)	31 (4%)	13 (6%)	7 (3%)
Native American	3 (2%)	27 (3%)	9 (4%)	1 (<1%)
Multiracial	—	—	5 (2%)	4 (2%)
Other	4 (3%)	22 (3%)	3 (1%)	2 (<1%)
Missing data	11 (7%)	22 (3%)	1 (<1%)	7 (3%)

^aNumber of respondents for gender, age, and ethnicity categories is based upon non-repeat contact interviews.

Table 2. Summary statistics for fishing frequency (number of days/year).

Location	N	Mean	SD	SE	Percentiles				
					5%	25%	50%	75%	95%
Duwamish River	149	16	30	2	1	1	4	16	94
Elliott Bay	796	36	65	2	1	2	10	40	156
North King County	198	54	71	5	1	11	28	63	240
King County Lakes	204	19	39	3	1	3	7	14	74

Table 3. Type of catch sought by anglers.

Location	N	% catch type		
		Fish (%)	Shellfish (%)	Both (%)
Duwamish River	152	80	8	12
Elliott Bay	807	89	3	6
North King County	228	77	17	5
King County Lakes	212	99	<2	0

Table 4. Species caught and kept by anglers.

Species	Duwamish river		Elliott Bay		North King County		King County Lakes	
	(N) Anglers	(N) Caught	(N) Anglers	(N) Caught	(N) Anglers	(N) Caught	(N) Anglers	(N) Caught
<i>Anadromous Fish</i>								
Salmon	0	0	11	11	2	2	9	30
Trout	0	0	0	0	0	0	16	31
<i>Marine Fish</i>								
Flounder	5	6	3	4	2	2	0	0
Gunnel fish (eel)	1	1	0	0	0	0	0	0
Herring	5	38	0	0	0	0	0	0
Lingcod	0	0	1	1	0	0	0	0
Rockfish	0	0	6	6	1	1	0	0
Sculpin	4	5	4	4	0	0	0	0
Sea perch	2	9	13	155	4	12	0	0
Sole	6	9	5	13	1	1	0	0
<i>Freshwater Fish</i>								
Bass	0	0	0	0	0	0	5	16
Bluegill	0	0	0	0	0	0	3	3
Bullhead	0	0	0	0	0	0	1	12
Yellow perch	0	0	0	0	0	0	14	75
<i>Shellfish</i>								
Clams	0	0	1	25	0	0	0	0
Crabs	15	52	17	60	12	22	0	0
Moonsnail	1	1	0	0	0	0	0	0
Shrimp	0	0	7	124	5	14	0	0

Consumption Preferences

The primary goal of the King County surveys was to describe consumption patterns of recreational anglers. A series of questions was asked during the interview to describe angler

consumption preferences. Anglers planned on using their catch in a variety of ways (Table 5). A majority of the anglers reported consuming their catch either individually (20–66%) or with others (35–57%). If anglers reported sharing their

catch with other people, they were asked if this included young children (<10 years old). The percent sharing with young children was 27%, 32%, 49%, and 46% from the Duwamish River, Elliott Bay, North King County, and King County Lakes, respectively. Other frequently described uses included: giving catch away (5–26%), using catch as bait (2–20%), or performing catch and release (9–64%).

The anglers who indicated that they would consume their catch were also asked what parts of the fish they typically consume (Table 6), and which cooking methods they typically utilize. Anglers from all locations primarily reported eating only the fillet or muscle of the fin-fish they collected (>88%), while a smaller portion reported consuming other portions of the fish (5–12%). Respondents consuming shellfish primarily reported eating only the meat of these species (>99%). Cooking techniques may alter contaminant concentrations (Morgan et al., 1997; Moya et al., 1998), thus it is important to understand the preparation methods of the survey respondents. The survey results identified that respondents preferred cooking their catch by baking, frying, grilling, boiling, or steaming. No respondents reported eating their catch raw or uncooked.

Consumption rates of King County anglers are presented in Table 7 for reported consumption of marine fish, shellfish, and freshwater fish. The consumption rates are reported by

area, and represent combined data across all freshwater locations or all marine locations. The (lower) Duwamish River anglers were included in the marine and shellfish consumption rates (i.e., rather than the freshwater consumption rates), because their measured catch — by virtue of proximity to Elliott Bay — included only marine species (Table 4). The mean (median) consumption rate for marine fish and shellfish was 53 (21) and 25 (11) g/day, respectively. The highest consumption rates were observed for Elliott Bay (mean = 63 g/day) anglers followed by North King County (32 g/day) and Duwamish River anglers (8 g/day). The mean (median) consumption rate from all freshwater locations was 10(0) and 7(0) g/day for respondents and their children, respectively. Although many respondents reported consuming fish from King County lakes, many had not consumed any fish in the previous month. Therefore, the median consumption rate was found to be 0 g/day.

Ethnic differences were examined for all marine locations and all freshwater locations, separately. The mean marine fish consumption rates were 73, 60, 50, 43, and 35 g/day for Native American, Caucasian, Asian and Pacific Islander, African American, and Hispanic/Latino respondents, respectively. The mean shellfish consumption rates were 40, 38, 20, 19, and 2 g/day for Native American, African American, Asian and Pacific Islander, Caucasian, and Hispanic/Latino respondents,

Table 5. Angler's intended use of catch.

	Duwamish river (<i>N</i> = 35 ^a) (%)	Elliott bay (<i>N</i> = 76 ^a) (%)	North king county (<i>N</i> = 133) (%)	King county lakes (<i>N</i> = 212) (%)
% of Respondents Who ^b				
Consume catch individually	20	21	62	66
Consume with others (family)	51	57	35	56
Give away	6	5	9	26
Sell	0	0	0	1
Use as bait	20	12	2	6
Catch and release	9	11	15	64
Other ^c	11	4	0	3

^aSample size is smaller than other tables since only anglers with a successful catch were asked this question.

^bRespondents may have indicated more than one intended use, therefore, total percent may exceed 100.

^cThe category for "Other" included any response that varied from the available questionnaire categories (e.g., "store for later use").

Table 6. Parts of fin-fish consumed.

Location	<i>N</i>	% portion consumed		
		Fillet without skin (%)	Fillet with skin (%)	Other parts (head, organs) (%)
Duwamish River	17 ^a	59	29	12
Elliott Bay	35 ^a	60	31	9
North King County	87	89	N/A ^b	10
King County Lakes	139	94	1	5

^aSample size is smaller than other tables since only anglers with a successful catch were asked this question.

^bThis survey did not differentiate eating fillet with or without skin.

N/A, not applicable.

Table 7. Consumption rates (g/day) for recreational anglers.

Location	N	Mean	SD	SE	Percentiles		
					50%	90%	95%
<i>Marine fish consumption</i>							
Duwamish River ^a	50	8	13	2	2	23	42
Elliott Bay	377	63	91	5	31	145	221
North King County	67	32	40	5	17	85	102
(All locations)	494	53	83	4	21	121	181
<i>Shellfish consumption</i>							
Duwamish River	16	20	33	8	4	77	123
Elliott Bay	49	28	33	5	14	74	119
North King County	31	22	33	6	12	62	132
(All locations)	96	25	33	3	11	60	119
<i>Freshwater fish consumption</i>							
King County Lakes (all respondents)	128	10	24	2	0	23	42
King County Lakes (children of respondents)	81	7	20	2	0	17	29

^aThe Duwamish River is tidally influenced by Elliott Bay and anglers exclusively caught marine species, therefore data for these locations were considered to represent marine conditions.

respectively. The mean freshwater fish consumption rates were 26, 13, 8, 6 g/day for African American, Asian and Pacific Islander, Caucasian, and Hispanic respondents, respectively. Statistical analyses of these consumption rates were not performed due to the low sample sizes of various ethnic groups.

Discussion

The results of this study provide pertinent information on the consumption patterns of anglers consuming fish and/or shellfish caught from water resources in King County, WA, USA. Information from the three surveys was utilized by the King County Department of Natural Resources and Parks in their exposure modeling for required environmental analyses of capital improvement projects. In addition, the Washington Department of Health used the results from the King County Lakes survey to set a consumption advisory for Lake Washington (WA DOH, 2004). Further, the results supplement previously existing consumption information and provide new data for freshwater fish consumption.

The patterns of marine anglers reported from the King County surveys are comparable to those previously reported for anglers in and around King County. Marine angler patterns reported here are similar and do not appear to have changed from studies conducted in the mid-1980s (Pierce et al., 1981; Landolt et al., 1985, 1987; McCallum, 1985). The frequency of fishing trips was widely variable in current and previous studies with an average of one fishing trip per week (Landolt et al., 1985, 1987). Anglers in all Puget Sound studies primarily sought fin-fish, while a smaller proportion intended to catch shellfish. Similar species were also caught

and kept by all Puget Sound anglers, including salmon, perch, and crab. However, previous surveys were able to collect more information on the number and types of species collected during the fishing trips (Pierce et al., 1981; Landolt et al., 1985, 1987; McCallum, 1985).

The consumption preferences and rates of marine anglers have remained consistent with previous investigations (Pierce et al., 1981; Landolt et al., 1985, 1987; McCallum, 1985). Anglers from all surveys primarily reported consuming the fillet of fish collected in King County, while a smaller proportion reported consuming other parts of the fish. Similarly, marine anglers from all studies chose to consume their fish cooked, while only a small proportion of all anglers (<5%) consumed their catch raw.

The consumption rates from previous marine surveys conducted in and around Puget Sound were re-analyzed by the US EPA (1988). Estimates of mean (median) marine fish consumption ranged from 39 to 61 (1.9–26) g/day (Table 8). Estimates of the 95th percentile of marine fish consumption from these surveys ranged from 24 to 246 g/day (US EPA, 1988). The fin-fish consumption estimates (i.e., mean, median, and 95th percentile) from the current investigation of marine locations (53, 21, and 181 g/day) fall within each of these ranges. Therefore, consumption rates of marine fish in King County do not appear to have changed over the past 20 years. Consumption rates of King County recreational anglers are higher than those reported by the US EPA (1999) for the general US population (Table 8). This is not surprising since a large portion of the US population may not fish as often as recreational anglers interviewed in this study. King County angler consumption rates were either comparable or less than the consumption rates from surveys

Table 8. Comparison of Consumption Rate Studies (g/day).

Location	Mean	Median	Upper percentile	Reference
<i>Marine fish</i>				
King County Recreational Anglers	53	21	181 (95th)	Current study
Puget Sound Recreational Anglers	39–61	1.9–26	24–246 (95th)	McCallum (1985), Landolt et al. (1985, 1987), Pierce et al. (1981), US EPA (1988)
King County Asian & Pacific Islanders (all finfish)	51	32	102 (90th)	Sechena et al. (2003)
Puget Sound Native American Anglers	81	50	200 (90th)	Suquamish Tribe (2000)
General US population	42	17	174 (95th)	Toy et al. (1996)
	14	—	63 (95th)	US EPA (1999)
<i>Shellfish</i>				
King County Recreational Anglers	25	11	119 (95th)	Current study
King County Asian & Pacific Islanders	54	31	107 (90th)	Sechena et al. (2003)
Puget Sound Native American Anglers	133	63	363 (90th)	Suquamish Tribe (2000)
	19	13	104 (95th)	Toy et al. (1996)
<i>Freshwater fish</i>				
King County Recreational Anglers				
Adults	10	0	42 (95th)	Current study
Children	7	0	29 (95th)	
Lake Roosevelt, WA Recreational Anglers	26 ^a	—	64 (90th) ^a	WA DOH (1997)
Columbia River tribes				
Adults	59	41	170 (95th)	CRITFC (1994)
Children	20	12	73 (96th)	
Recreational Anglers US (AL, CT, IN, MN, MI, WI, Lake Ontario)				Connelly et al. (1996), Ebert et al. (1993), 1996; Fiore et al. (1989), Meredith and Malvestuto (1996), Scheaffer et al. (1999), West et al. (1989, 1993), Williams et al. (2000)
Adults	2–30	—	12–61 (95th)	
Children	5–8	—	—	
US EPA default consumption rate	17.5	—	142.4	US EPA, 2000

^aEstimated values based on number of meals per year (42 and 103), multiplied by an 8-ounce meal (227 g), divided by 365 days/year.

of Asian and Pacific Islanders and Native Americans (Table 8). These results suggest that this survey may have captured respondents that consume self-caught fish at rates comparable to known subsistence populations.

Estimates of shellfish consumption have not been previously described for recreational anglers in King County. Marine anglers from the present surveys were estimated to have shellfish consumption rates (mean, median, and 95th percentile) of 25, 11, and 119 g/day, respectively (Table 8). Mean and median shellfish consumption rates were generally lower than those from Asian and Pacific Islanders and Native American anglers (Table 8). Thus, a large portion of the interviewed King County recreational anglers appears to consume shellfish at a lesser rate than known subsistence populations.

Freshwater fish consumption has not been previously examined in King County. Adult freshwater anglers from the present surveys were estimated to have fin-fish consumption rates (mean, 95th percentile) of 10 and 42 g/day. Children's freshwater fin-fish consumption rates (mean, 95th percentile) were 7 and 29 g/day (Table 8). These rates are comparable to other Washington State or national recreational consumption

surveys, which ranged from 2 to 30 and 5 to 8 g/day, for adults and children, respectively (Table 8). Freshwater fish consumption rates from King County were lower than subsistence consumption rates reported from a survey of Native Americans (Table 8). The present consumption rates are also lower than the US EPA default consumption rate for recreational anglers (Table 8), suggesting that the use of the US EPA default consumption rate for King County freshwater anglers may result in overestimates of exposure.

Consumption surveys typically contain unavoidable sources of error (US EPA, 1998). For example, the questions on fishing or consumption frequency are subject to recall bias. The consumption rate equations for fish and shellfish consumption are primarily based on the frequency estimates, and thus may be over or under-estimated. In addition, creel surveys of this type may over-sample frequent anglers (Price et al., 1994) and may lead to over-estimation of the consumption rate for the general population. Finally, consumption rates were calculated based on several assumptions for the frequency, weight of catch or meal size, cleaning factor, and the number of people sharing their catch. These assumptions will lead to potential error or bias in the

estimated consumption rates. Thus, the uncertainties inherent in these surveys should be recognized when interpreting the results.

Conclusion

Three fish consumption surveys were conducted in King County, WA, USA during 1997–2003. These surveys were conducted to support environmental analyses of proposed capital improvement projects planned by the King County Department of Natural Resources and Parks. The results of the surveys provided updated information for marine angler consumption patterns and new information for freshwater anglers. Survey results suggest that King County seafood consumption patterns have remained stable since the mid-1980s. The surveyed populations were also found to have consumption rates that are comparable to other regional and national recreational anglers. These surveys provide estimates of marine fin-fish and shellfish and freshwater fin-fish consumption rates suitable for risk assessments considering the general population of anglers residing in Puget Sound, WA, USA.

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From: [Sheila Furlong](#)
To: [ECY RE Fish Consumption](#)
Subject: Public comment on rate of consumption
Date: Sunday, November 27, 2011 5:35:13 PM

Hello,

As more and more people try to cut back on red meat and eat more fish, it's obvious from several sources that consumption rates are higher.

1. Check the ads for grocery stores, including the "box" stores. Not only are the number of seafood ads triple what they used to be, all are showing at least a few local choices.
2. Restaurants have more local seafood on their menus.
3. Even hospitals and other venues (fairs and sporting events too) that didn't try to provide a range of choices now have seafood entrees.
4. People who are transitioning from meat to vegetarian quite frequently still eat a little fish to provide the nutrients they lack.

Using myself and friends and family as examples, we went from 2 times a week 10 years ago, to 5-7 times a week currently. Some of it in the form of canned tuna at lunch, or tuna noodle casserole at dinner. Mostly we choose halibut and wild salmon, and some shrimp. We want to choose locally caught seafood whenever possible for lots of reasons. It's critically important that we improve and sustain clean, safe waters to keep our food safe as well.

The days of being able to hide the pollution, toxic chemicals and disregard for the public is at an end. Awareness is rapidly spurring people to use every available source to find out the information that too many companies have tried to hide in the name of profit. Hopefully more people in charge of a company's direction will think long term, beyond the next quarters' earnings, and demonstrate the leadership we expect of them, and do the right thing.

Respectfully,
Sheila Furlong

From: [Sharon](#)
To: [ECY RE Fish Consumption](#)
Subject: Why eat Puget Sound seafood that is toxic?
Date: Tuesday, December 13, 2011 11:27:58 PM

FYI: I consume no local seafood because I know how toxic you have let our waters become. The top of the food chain Orcas have no choice but to eat the toxic fish but top of the food chain humans do. Don't eat the seafood... until our waters are cleaned up. Why do you have regulations that indicate you will clean up the waterways depending on how many people actually eat the toxic seafood - when humans should decrease eating seafood because of the increasing toxic nature to our fish and other seafood - more people appear to be eating it.

I am not one of them. Help clean up our waterways.

Sincerely,
Sharon O'Hara, COPD and Other Stuff
Kitsap Sun, Reader/Patient Blog

From: [Robin Paster](#)
To: [ECY RE Fish Consumption](#)
Subject: needed: greater accuracy in fish consumption rate numbers
Date: Wednesday, December 14, 2011 9:45:21 AM

Dear Director Sturdevant and staff,

Washington water quality standards are being established on an outdated and inaccurately low fish consumption rate.

Washingtonians, especially in the Puget Sound region, consume quantities of fish and other seafood that are higher than when the official consumption rate was established. Yet this rate is still being used to determine our clean water standards.

Since that rate was established, our residents have not only learned, but been bombarded with, information regarding the nutritional and health value of consuming fish. And based on that information, as well as our easy access to fish and other seafood, we have significantly increased our fish consumption.

Residents are currently consuming large quantities of fish (most people eating fish multiple times per week, if not daily) believing it is healthy. However, unless our water quality standards are increased to reflect our consumption, the benefits of the fish will be more than offset by the chemical toxins ingested with it.

Unfortunately, among the people most affected by the current standards are Native Americans who eat lots of fish, in part, as part of a traditional diet, and the poor who eat local fish because they can catch and eat it for free.

I urge you to increase our state's fish consumption rates to reflect our true and greater rate of fish consumption.

Thank you.

Robin Paster
NE 160th St.
Woodinville, WA 98072



December 16, 2011

Mr. Ted Sturdevant, Director
Washington State Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

SUBJECT: Comments on Draft Fish Consumption Rate Technical Background Document (September 2011, Publication No. 11-09-050)

Dear Director Sturdevant:

Thank you for your October 14, 2011 letter that provided both an overview of the Department of Ecology's current efforts to update the fish consumption rates used in the Washington State Sediment Management Standards, Water Quality Standards, and the Model Toxics Control Act (MTCA), and offered to engage in government-to-government consultation on this issue. The purpose of this letter is to provide comments on the Draft Fish Consumption Rate Technical Background Document (Publication No. 11-09-050) and to transmit preliminary information from the on-going Lummi Diet Study.

Comments on the Draft Fish Consumption Rate Technical Background Document include:

- 1. Lower Limit of Recommended Rates:** Ecology chose the 80th to 95th percentile of the combined local consumption surveys to define a range of proposed consumption rates (157g/day to 267 g/day). The 95th percentile is commonly used in statistical applications to define an upper boundary (beyond the 95th percentile a "diminishing return" is assumed), but no reason is provided for choosing the 80th percentile as the lower boundary. Several reasons for choosing these rates are listed, including the recommendations of the *Human Health Focus Report Oregon Fish and Shellfish Consumption Rate Project*, 2008. However, this study from Oregon actually recommends using rates in the 90th to 95th percentile. The 90th percentile (210 g/day) should be used as the lower boundary of the range rather than the 80th percentile.
- 2. Inclusion of Anadromous Species (Salmon) in Consumption Rates:** The Technical Background Document leaves open the question of whether or not salmon and

other anadromous species should be included in the new Washington consumption rates. This should not be an open question – salmon should be included in the new Washington consumption rates. The research presented in Appendix E describes how some species of salmon (Chinook) have extended resident times in Puget Sound and suffer especially from a high contaminant load. In addition, the Oregon Department of Environmental Quality (DEQ) argues in the 2008 *Human Health Focus Report Oregon Fish and Shellfish Consumption Rate Project*, that salmon consumption should be included in fish consumption rates. The Oregon Human Health Focus Group states that salmon is known to be consumed at specific quantities and contributes to the contaminant load of the consumers and therefore should be included in fish consumption rates to account for the exposure to these chemicals. In addition, salmon accumulate toxins within natal streams, local estuaries, and Puget Sound waters and are the predominant seafood in tribal and non-tribal communities in the Pacific Northwest.

As you may know, the Lummi Nation is in the process of conducting a Lummi specific diet study to both inform the triennial review of the Lummi Nation Water Quality Standards and the Washington State water quality and sediment standards. To date, 40 out of our targeted 100 surveys have been completed and entered into the database. We have decided not to include individuals whose consumption rates are greater than the 95th percentile of responses out of concern that these outlying values would have undue leverage on the final estimate and adversely impact the precision goal for the survey. Out of the 40 respondents so far, two individuals were removed that exceeded the 95th percentile. Overall, the mean consumption rate for the remaining 38 respondents was 5.1 g/kg/day or 390 g/day. The precision of these estimates is 26 percent and 24.5 percent respectively. We will provide our final report when it is completed during the second quarter of 2012.

Sincerely,

A handwritten signature in blue ink that reads "Merle Jefferson". The signature is fluid and cursive, with the first name "Merle" and last name "Jefferson" clearly distinguishable.

Merle Jefferson, Sr., Executive Director
Lummi Natural Resources Department



COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

729 NE Oregon, Suite 200, Portland, Oregon 97232

Telephone 503 238 0667

Fax 503 235 4228

December 21, 2011

Martha Hankins
Toxics Cleanup Program
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

RE: Draft Fish Consumption Technical Support Document

Dear Ms. Hankins:

The Columbia River Inter-Tribal Fish Commission (CRITFC) and the over 20,000 registered members of the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes and Bands of the Yakama Nation, and the Nez Perce Tribe, appreciates the opportunity to provide the following comments on the Department of Ecology's Fish Consumption Technical Support document.

CRITFC commends Ecology's efforts to compile this report and respond to tribes' requests for information. The report provides a thorough examination of relevant regional fish consumption rate studies and concludes by recommending that Washington State make significant changes to their default fish consumption rates. The report recommends a fish consumption rate in the range of 157 to 267 grams per day. These results are consistent with the findings of CRITFC's comprehensive fish consumption study that was conducted in 1991-1992, which documented that a fish consumption rate of 176 grams per day would be protective of 95 percent of the adult population and 389 grams per day would be protective of 99 percent of the adult population. Based on the CRITFC study, the current fish consumption rate of must be increased in order to be protective of Washington fish consumers.

Increasing the current Washington fish consumption rate will ultimately lead to decreasing the levels of toxic pollution that are considered "allowable" in our rivers, lakes, and streams. The importance of fish to the tribes cannot be overstated for the fishery resource is not only a major food source for tribal members; it is also an integral part of our cultural, economic, and spiritual well-being. As ceremonial and subsistence fishers, we rely on the protection and enhancement of water quality to a level that is sufficient to protect our water and fish from harmful exposure to waterborne pollutants.

Recent studies demonstrate that salmon receive a significant percentage of their body contaminant burden from the freshwater portion of their life cycle through contact with contaminated sediments and ingestion of contaminated food sources. (NOAA, 2009, Data Report for Lower Columbia Juvenile Salmon Persistent Organic Pollutant Exposure Assessment, prepared by the Environmental Conservation Division, Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, for the NOAA Damage Assessment Center and Portland Harbor Natural Resource Trustees; and Sloan, C.A., et. al, 2010, Polybrominated Diphenyl Ethers in Outmigrant Juvenile Chinook Salmon from the Lower Columbia River and Estuary and Puget Sound, Washington, Arch. Contam. Toxicol, (2010), 58:403-414.) Ecology should consider these findings when reviewing the discussion contained in Appendix E – *The Question of Salmon*. In contrast, we are concerned that the EPA Region 10 framework discussed on page 78-79, might be used as a precedent for not including salmon in an overall fish consumption rate without site-specific chemical-specific evaluations. Salmon, as well as other tribally significant aquatic species such as steelhead, lamprey and sturgeon, must be included by default when assessing the risks from consumption of fish in order to accurately represent tribal exposure to environmental toxicants.

In ceding large portions of their aboriginal lands to the United States, the CRITFC tribes reserved the right to continue to fish at all usual and accustomed sites for ceremonial, subsistence, and commercial purposes. As demonstrated in the CRITFC fish consumption study fish remain a mainstay of tribal diets throughout the Pacific Northwest. Tribes have legally protected rights to safely consume fish at subsistence levels and the standards set by the state of Washington must consider these rights when it issues standards that so directly impact the safety of tribal populations.

Adoption of a default fish consumption rate that is protective of tribal members will allow all Washingtonians the ability to enjoy the benefits of living in a land whose waters are better protected from toxic pollutants. Thank you for the opportunity to express these opinions on this matter.

Sincerely,



Babtist Paul Lumley
Executive Director

Date: December 28, 2011
To: Craig and Martha Hankins
From: Nancy Winters
Subject: Comments on Fish Consumption Rates – Technical Support Document

I am preparing these comments as a private citizen who is both health conscious and a frequent consumer of fish. I very much appreciate the Toxics Cleanup Program's willingness to take on the difficult issue of establishing an updated fish consumption rate for sediment remediation. I think you for the opportunity to comment.

My comments can be divided into two general categories: Ecology's Two-Part "Parallel" Rule-Making Approach and Specific Fish Consumption Rate Report.

Ecology's Two-Part "Parallel" Rule Making Approach

I am deeply concerned about what Jim Pendowski, Program Manager of the Toxics Cleanup Program (TCP), referred to at the first meeting of the Sediment Management Standards Advisory Committee as the "parallel" rule-making approach that Ecology's two programs are taking in promulgating water quality and sediment cleanup standards. This approach is certainly NOT parallel, but is sequential, at best. My concern over the sequential approach has a number of bases. First, the current FCR under the SMS is almost an order of magnitude higher than that which is the basis for the water quality standards. The two programs have functioned with the two disparate FCRs for more than two decades years. In those years, the Water Quality Program has not been persuaded, encouraged, cajoled, or legally forced to grapple with this difficult issue and amend the water quality standards to come into line with the cleanup standards. No amount of rhetoric, even at the level of the Director can assure the public that the Water Quality Program (WQP) will deviate from their historical approach.

I also note that under the parallel approach, the WQP will not promulgate water quality standards based on more protective FCRs until after the next gubernatorial election. With changes of administration come inevitable delays, and depending on the outcome of the election, may ultimately result in no promulgation of water quality standards based on protective FCRs.

Third, no science or logic can support a system that continues to allow dischargers to add pollutants at a level that requires an infinite do-loop of cleanup.

Finally, the WQP program is not acting in compliance with the policy enunciated in RCW 90.48

"to maintain the **highest possible** standards to insure the purity of all waters of the state consistent with **public health** and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state of Washington."

Acting on behalf of the citizens of the state and in compliance with the policy, the WQP would recognize and act immediately to promulgate rules that are protective of its citizens. In promulgating human health based standards in the past, the WQP has based standards on

protecting from carcinogenic risks at a level of one in a million incremental risk of cancer. It has used the 90% of exposures when making assumptions about period of exposures to protect the vast majority of Washington's citizens. With the FCR report it is clear that the 90%ile of FCR in Washington is 210 g/d – a factor of 32 greater than the protection Washingtonians are now receiving.

It is time for the WQP to take a similar “can do” to approach TCP, deal with this thorny issue straight on, and promulgate water quality standards **simultaneously** with the TCP cleanup standards.

Specific Fish Consumption Rate (FCR) Report

This FRC Report is an excellent report, which establishes a scientific framework for the decision-making required by the TCP in their SMS rule-making efforts. The report is thoroughly research, well written, and well presented. My comments deal with the next steps – deciding on the appropriate FCR.

I agree with the inclusion of consumption of salmon into the establishment of a FCR. Its inclusion makes good policy sense for a state that is dependent on the commercial salmon fishery.

In promulgating earlier regulations (under MTCA, SMS, and Groundwater Quality Standards), the Department has taken seriously its charge to protect human health by making conservative assumptions in calculating the standards to be met. For example, in the Groundwater Quality Standards, the criteria are based on a one in a million incremental risk of cancer. Both the Groundwater Quality Standards and the MTCA Cleanup standard are also based an assumption of a 30-year exposure to drinking water (the 95%ile of the frequency with which the population moves) and a consumption rate of 2 liters/day (the 90%ile). Promulgated fish consumption rates should seek to protect no less than the 90%ile of our population. Data from EPA's 2002 report indicate that 90% of the population consumes 250 g/day or less. The more Washington-specific estimates indicate that 90% of the Washington population consumes 210 g/day or less. Either of these values is technically-defensible and would follow Ecology's earlier policy established across programs. I urge TCP and WQP to adopt a FRC of no less than the 90%ile of our population (i.e., 210 g/day)

Finally, TCP should promulgate a single **minimum** default FCR, rather than a range of rates. From a pragmatic standpoint a single FCR will reduce the amount of legal haggling over cleanup levels. A minimum standard will allow for higher FCRs to be negotiated where specific populations would receive higher exposure based on higher population specific consumption rates.

Thank you again for your consideration.

From: [Jim Miller](#)
To: [ECY RE Fish Consumption](#)
Subject: Comments on Proposed Revisions to Fish Consumption Rates
Date: Thursday, January 05, 2012 3:00:19 PM

The comments offered below are my own, as a professional in the environmental industry for more than three decades, and do not necessarily reflect the views of my company.

I am alarmed at Ecology's proposal to increase the default fish consumption rates for Washington State residents. These fish consumption rates are applied through multiple levels of theoretical, conservative assumptions to develop sediment cleanup levels, soil cleanup levels for sites in proximity to receiving waters, groundwater cleanup levels and surface water cleanup levels. As acknowledged by Ecology, the results of these "risk-based" calculations sometimes produce cleanup levels that are lower than "background" concentrations. If the fish consumption rate standard is increased, the resulting cleanup levels will be decreased accordingly. I would expect that most, if not all, of the resulting sediment and soil cleanup levels will be lower than background.

Simply because a segment of the population may consume fish or shellfish in relatively high amounts, that fact does not bequest a duty on society to assure that ALL fish and shellfish are safe to consume regardless of where or when they may be obtained. Common sense says that one would use good judgment in where and when individuals obtain their food. Even though I may *like* to harvest clams during a period of red tide, common sense and public notices are sufficient to have me delay those activities or direct them elsewhere.

Our industrial waterfront areas are critically important to the economic viability and sustainability of our region. Reasonable approaches to cleanup of genuine hazards to human health and the environment are appropriate and necessary for these areas. But removing sediment and/or shoreline soil to "background" levels is irrational from a balanced public policy perspective. I believe that implementation of higher fish consumption standards will inevitably result in more important industries leaving our state, the creation or unwanted shoreline brownfield sites that the public cannot afford to remediate, more lawsuits and disputes over cleanup regulations, and fewer (not more) site cleanup efforts. Shoreline site remediation to current standards is largely infeasible from a cost and practical perspective; higher fish consumption standards will only make matters worse.

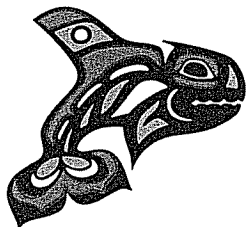
I urge Ecology to consider the economic consequences of increasing the fish consumption rate for Washington, in addition to environmental and political pressures. From a policy perspective, I urge Ecology to use default fish consumption standards that are consistent with those used by the federal government. We don't need Washington to set unattainable goals that go beyond federal requirements and penalize the weakened economy of our state.

James A. Miller, PE, LG
Senior Principal | GeoEngineers, Inc.

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Northwest Indian Fisheries Commission

6730 Martin Way E., Olympia, Washington 98516-5540

Phone (360) 438-1180

www.nwifc.org

FAX # 753-8659

January 3, 2012

Ted Sturdevant, Director
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600
fishconsumption@ecy.wa.gov

RE: Comments on Fish Consumption Rate Technical Support Document

Thank you for providing the Northwest Indian Fisheries Commission with the opportunity to comment on Publication no. 11-09-050: "Fish Consumption Rates Technical Support Document: A Review of Data and Information about Fish Consumption in Washington" dated September 2011. The tribes appreciate the serious effort that Ecology staff members have made to meet with tribes throughout Washington on this important issue. Many tribes will also be providing specific comments about the document.

The tribes would like to emphasize the difference between tribal fish consumption rates and the default rates which will be established by the state of Washington.

Tribal governments have the ability to set their own fish consumption rates based on data they collect about the dietary habits of their tribal people. Tribal fish consumption rates are used for establishing standards on the lands and waters that the tribes govern. Tribes with water quality standards are responsible for monitoring, enforcement, and cleanup duties according to the standards they adopt.

Similarly, the state of Washington establishes fish consumption rates for Washington residents. Dietary surveys cited in the Technical Support Document indicate that Washington residents consume fish and shellfish at rates that are likely higher than national averages. Specific groups of Washington residents, such as tribes and Asian/Pacific Islanders, consume fish and shellfish at even higher rates. The state must consider these fish consumption rates in determining standards for water quality and toxic cleanup that are sufficiently protective of all people in Washington. We would like to emphasize that the proposed rates will be state standards, and tribes will continue to set their own standards based on their own fish consumption and availability.

Existing fish consumption rates have been suppressed.

Historical tribal fish consumption rates cited in the Technical Support Document include estimates of approximately 1,000 grams per day prior to dams and other habitat alterations (p 87). The availability of abundant and uncontaminated fish and shellfish is a major concern to tribes, since habitat loss and degradation and other factors have significantly reduced the amount and type of fish that is available for tribes to safely harvest and consume. As noted in the recent workshop on fish consumption rates, tribal consumption has been suppressed by several factors including declining abundance of fish resources, lack of opportunity to go fishing and loss of access to fishing grounds, prohibition of fishing and gathering due to known contamination, and avoidance of seafood consumption due to perceived contamination and risk warnings. In the 1970s, tribes struggled with legal suppression of fishing opportunity, leading to the affirmation of

treaty fishing rights in *U.S. v. Washington* 384 F. Supp. 213 (1974). In recent years, tribal harvest of Chinook and coho salmon has dropped below pre-Boldt levels, and the trend continues downward. The recent report by the Northwest Indian Fisheries Commission, "Treaty Rights at Risk," describes the loss and degradation of habitat throughout western Washington, and the resulting loss of tribal opportunity to fish for subsistence and livelihood. Historical habitat loss for salmon and the pollution of shellfish harvest areas in Puget Sound are further described in the Puget Sound Salmon Recovery Plan and the 2009 State of the Sound Report.

Tribes are constantly working to restore fish and shellfish populations above status quo levels and want to ensure that, once restoration is successful, they can safely consume these traditional and nutritious food sources. Contemporary tribal fish consumption rates of approximately 500 grams per day have been estimated by researchers who have investigated suppression effects. This research is acknowledged in the Technical Support Document (p 96). The state should align fish consumption rates with restoration objectives, and provide a clear path forward and commitment to re-address and adjust the default rate as habitat is restored and improvements to water quality are made. Individual tribal studies already indicate that fish consumption rates are likely to rise in the future as resource availability improves.

Fish consumption rates in Washington apply across many tribal usual and accustomed areas.

Tribal usual and accustomed fishing and harvesting areas were established by treaty; degradation of these areas prevents the full exercise of treaty and trust protected rights. Tribes are unable to adjust the location of fish and shellfish harvest if areas are contaminated or otherwise degraded. The Technical Support Document contains a section about the possibility of site-specific fish consumption rates (p 92) but does not specify criteria or how this option would be applied. Tribes assume that site-specific rates would be more protective than default rates throughout tribal usual and accustomed areas.

Salmon are essential to tribal cultures, economies, and diets and must be included in default fish consumption rates.

The Technical Support Document raises the question of whether salmon should be considered in fish consumption rates because they transit through contaminated and uncontaminated areas during their life cycle. Salmon must be included in fish consumption rates as they accumulate toxins within natal streams, local estuaries, and Puget Sound waters that are within the jurisdiction of Washington State. Salmon are the predominant seafood in tribal and non-tribal communities in the Pacific Northwest and exclusion of salmon from protective standards would create a substantial risk to public health and environmental quality.

Tribes assume that an increase in the fish consumption rate that is protective of human health will not coincide with a reduction of other protective factors affecting the standards. For example, the target cancer risk level should not be relaxed as a condition of a more protective fish consumption rate. Fish consumption rates are part of a complex formula to address the potential risk from toxic chemicals that is used for toxic cleanup and water quality standards. A statement of assumptions about other relevant risk factors should be included in the document along with the basis for these assumptions.

Tribes support standards that are more protective of the fish-consuming population in Washington.

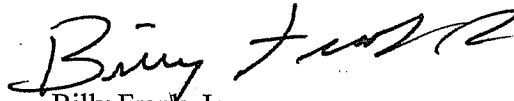
Existing default rates for fish consumption used in cleanup, sediment management, and water quality standards in Washington State are clearly inadequate to protect public health from persistent toxic contaminants. The proposed range offered in the Technical Support Document

for a range of 157 to 267 grams per day as a default fish consumption rate represents a substantial improvement over existing rates and is thus a step forward. However, many tribes have already documented higher fish consumption rates among tribal citizens and thus support revised state rates that are at or above the high end of the range. The higher end of the range reflects a more protective level, particularly since the proposed range does not account for the suppression factors described above, or the increasing trend of seafood consumption in the state and nation.

The proposed range of 157 to 267 grams per day is based on real consumption in Washington, not an imaginary or artificial standard. The range represents a statistical composite of locally-derived fish consumption data, set at the 80th to 95th percentile of fish-consuming populations. Some of our individual tribes and tribal citizens clearly consume more on a regular basis. The low end of the range (157 gpd) is less than the mean fish consumption rate derived in one Puget Sound tribe's dietary survey. Washington State is required to use local data, establish a high level of protection for populations throughout the state, and protect high-risk populations including tribes. Washington State standards should be at least as protective as the fish consumption rate of 175 grams per day that was recently approved by the EPA for the state of Oregon. In addition to establishing a more protective rate, the key to keeping fish safe for consumption will be a rigorous program of implementation as the standards are applied in the future.

Eating seafood in the Pacific Northwest is a lifestyle choice for most people, but for tribes the consumption of fish and shellfish is their life and legacy. Fish is a first food for tribal children and the foundation for the healthy hearts of the elders. Tribal communities are asking how to reduce the input of toxic chemicals into the environment in order to keep these essential food sources safe. A fish consumption rate that is more realistic and hence more protective of Washington residents will be an important step in protecting this healthy choice in the future.

Sincerely,

A handwritten signature in dark ink, appearing to read "Billy Frank, Jr.", with a stylized, cursive script.

Billy Frank, Jr.
Chairman

cc: NWIFC Commissioners
Tribal Fish Consumption Workgroup
Jannine Jennings, EPA
Jim Woods, EPA

From: [Everett Billingslea](#)
To: [ECY RE Fish Consumption](#)
Subject: Comments on Proposed Revisions to Fish Consumption Rates
Date: Monday, January 09, 2012 3:55:06 PM

Clearly, Washington is one of the most environmentally aware and progressive states in the country. We have stringent federal, state and local (particularly in Seattle) regulation to minimize discharges to our water bodies and to make sure they are cleaned up. At the same time, few people would argue that we must not maintain an economic base to fund cleanups and environmental responsibility, and to pay taxes for education and all other aspects of modern society. If our sole goal as a society were to return our environment to a pristine state, we would shut down all waterfront industry; however, most people recognize that a balancing is required.

We are deeply concerned that the proposed changes to assumed fish consumption rates will create an imbalance, intended or unintended, that will result in a real and tangible reduction in water-dependent businesses and adversely affect Washington's economic vitality. In other words, the true cost of the changes to fish consumption rates may be much higher than most people expect. Meanwhile, the resultant environmental gain is likely to be theoretical and intangible, given that very few, if any, people actually consume fish at the assumed rates.

Through various complex formulas, the fish consumption rates drive clean up levels. Ecology has acknowledged that its risk-based calculations are very conservative and may already result in driving some clean up levels lower than natural background levels. The clean up levels will be reduced further under the proposed new rules. Cleaning up below natural background defies common sense. At the very least the regulations should establish a floor for sediment cleanup levels that provide a reasonably attainable cushion above natural background level for a given chemical constituent.

That we are currently experiencing a time of economic difficulty is no excuse to turn our back on the environment. However, it is an impetus to reassess the conservative and unrealistic assumptions on which the fish consumption rates are based, sharpen our pencils and spend our limited environmental restoration money where it is most effective. The proposed changes to the fish consumption rates are not an efficient use of limited resources and, more so, will be detrimental to economic vitality.

By way of precedent and example we point out the current issue with the City of Seattle/King County sewer overflow. There, we are looking at a \$1.2 billion cost to capture the "last drops" of overflow. Yet many studies have shown that the same money could do much more environmental good elsewhere. Even some prominent clean water advocates have recognized the law of diminishing returns – that we can no longer do it all and must make choices.

http://seattletimes.nwsourc.com/html/localnews/2017147361_cso03m.html

It is not too late to make the right choice in this case and leave the fish consumption rates unchanged, add a reasonable floor to sediment cleanup levels, and allow funding to be used better elsewhere.

Everett H. Billingslea

ALASKA MARINE LINES, INC.

LYNDEN INCORPORATED

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DALE E. ARNOLD
DIRECTOR

VIA E-MAIL to fishconsumption@ecy.wa.gov

January 10, 2011

Toxics Cleanup Program
Washington State Department of Ecology
fishconsumption@ecy.wa.gov

RE: City of Spokane Comments - Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington (September 2011)

To the Department of Ecology:

Thank you for the opportunity to review the referenced Fish Consumption Rates Technical Support Document. The City of Spokane Wastewater Management Department offers the following comments:

Practical Implications of Increasing Fish Consumption Rates

The City of Spokane acknowledges that, according to surveys conducted for the technical support document, a relatively small percentage of Washingtonians may consume more than the current EPA standard of 6.5 grams per day. (Table A-1 shows that Ecology used data from 1,188 surveyed adults to develop the proposed default fish consumption rate; there are about 6.7 million Washington residents according to the 2010 census.) However, practical implications of increasing the fish consumption rate are not identified. Fish consumption rates drive water quality and sediment cleanup standards. Increasing the adopted fish consumption rate will therefore sharply increase the stringency of water quality and sediment standards, and increase the cost of attaining those more stringent standards.

Many dischargers, including stormwater and wastewater municipalities and industries, are unable to meet water quality standards at the currently adopted fish consumption rates. Multiple factors contribute to this, including a lack of technology available to achieve current standards and the expense of treatment and infrastructure. In addition, several human-made contaminants have become ubiquitous in the environment at concentrations higher than water quality standards due to factors beyond the control of dischargers such as air deposition and foreign import. The current fish consumption rates should not be increased until Washington waters meet current standards. After current standards are met, a framework should be adopted to aid dischargers in meeting incrementally more stringent water quality standards over the decades-long timeframe that will be required.

Federal Standards

Human-health based ambient water quality criteria used in The National Toxics Rule are based on a fish consumption rate of 6.5 grams per day. The EPA currently recommends a fish consumption rate of 17.5 grams per day. The Washington State Department of Ecology, however, proposes to use 150 to 275 grams per day which is 10 times more stringent than the federal standard. Ecology needs to develop

and articulate both the public health need and a regulatory basis for setting a statewide standard that is far more stringent than the standards EPA recommends.

Timeline

Ecology proposes to have the default fish consumption rates finalized in Washington by Fall 2012 after publishing the technical support document in September 2011. This time frame must be extended. Washington has an opportunity to learn from Oregon State's process. Oregon only recently finalized a new default fish consumption rate in October 2011. Washington will observe the implications, implementation, and unforeseen complications that arise from this rule and learn what has worked from the process and what may be done better. In addition, rushing to a final fish consumption rate only one year after the draft technical support document is published is unnecessary. The City of Spokane asks that Ecology develop a timeframe that would at least permit meaningful observation and "lessons learned" from Oregon's process.

PCBs and Human Health

Have any studies been performed that focus on particular PCB congeners found in fish tissue that cause cancer risk in humans? It is our understanding that not all PCB congeners are hazardous to human health. Fish tissue should be analyzed for presence of the same PCB congeners that pose a human cancer risk.

Site-Specific Fish Consumption Rates

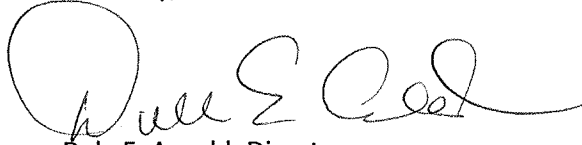
As shown in the technical support document, people eat fish and shellfish in varying quantities in each region and water body. The amount of shellfish consumed in western Washington is far greater than the amount of shellfish consumed in eastern Washington, for example. In addition, some ethnic populations consume more fish and shellfish and Ecology should consider focusing efforts to develop site-specific consumption rates for waterbodies serving these unique populations. Given the disparity of consumption across the State, site-specific fish consumption rates should be developed by Ecology. Realistically Fish consumption is not often from the same impacted body of water, and by assuming this for all situations it results in overly conservative concentration allowed for consumption.

Validity of Survey

It is not clear from the technical support document whether the survey questions asked participants for fish consumption rates generally, or if the questions asked specifically for rates of consumption of fish caught in Washington State water bodies. It seems likely that most of the fish consumed by Washingtonians generally is not actually caught in Washington State water bodies. It does not make sense to set fish consumption rates for Washington State, which will in turn be used to set water quality and sediment quality standards for Washington State water bodies, using surveys regarding fish consumption generally.

Thank you in advance for your consideration of these comments. Please call me at 509-625-7900 if you have questions or would like more information.

Sincerely,

A handwritten signature in dark ink, appearing to read "Dale E. Arnold". The signature is fluid and cursive, with a large initial "D" and "A".

Dale E. Arnold, Director

City of Spokane Wastewater Management

cc: Lars Hendron; Principal Engineer
 Gary Kaesemeyer; Collection System Superintendent
 Carrie Holtan; Assistant City Attorney
 Marcia Davis; Senior Engineer
 Raylene Gennett; Stormwater District Supervisor
 Tim Pelton; Administrative & Technical Superintendent
 Mike Coster; Operations & Maintenance Superintendent
 Lloyd Brewer; Manager – Environmental Programs
 Doug Greenlund; Environmental Analyst
 Lynn Schmidt; Stormwater Permit Coordinator
 Janet Davey – Wastewater Management Files



NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT, INC.

West Coast Regional Center

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Steve Stratton
Regional Manager
sstratton@ncasi.org

January 11, 2012

Washington State Department of Ecology
PO Box 47600
Olympia, Washington 98504-7600

RE: Comments on Publication No. 11-09-050, *Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington*

The National Council for Air and Stream Improvement, Inc. (NCASI) is an independent, nonprofit membership organization that provides technical support to the forest products industry on a wide range of environmental issues. An important part of our mission is to ensure that regulatory decision making is based on sound science. In this capacity, NCASI reviewed the September 2011 document titled: *Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington* (Publication No. 11-09-050), and offers the attached comments.

Overall, NCASI finds that Ecology has not made a compelling case for increasing statewide default fish consumption rates (FCRs). Ecology should clearly explain the level of protection afforded by existing environmental standards for protection of human health, and the incremental benefit to public health that would result from making these standards up to 41 times more stringent. We also have serious concerns that the fish consumption data used to develop the proposal are not representative of the general population, and that these data have been interpreted in an arbitrary manner that leads to an extreme conclusion.

Sincerely,

Jeffrey Louch, PhD.
Senior Scientist, NCASI

Steve Stratton
West Coast Regional Manager, NCASI

cc: Christian McCabe, Northwest Pulp & Paper Association
Paul Wiegand, NCASI

NCASI COMMENTS ON WASHINGTON'S PROPOSAL TO REVISE STATEWIDE DEFAULT FISH CONSUMPTION RATES

In September 2011 Washington State Department of Ecology (Ecology) issued Publication No. 11-09-050, *Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington*. This technical support document (TSD) summarizes available fish consumption studies and proposes that the state adopt default fish consumption rates (FCR) of between 157 and 267 grams per day (g/day). One or more default rates would be used to establish regulatory requirements under the following programs:

- Sediment Management Standards (SMS) rule, which establishes standards for cleanup of contaminated sediments in fresh and marine waters; this rule is currently being revised and a default FCR will be part of the revisions
- Model Toxics Control Act (MTCA), which regulates cleanup of contaminated soils and sediments
- Clean Water Act water quality standards (WQS) established by states and tribes to limit the effects of contaminants ingested with fish and water on human health.

Current default FCRs are 6.5 g/day for WQS and 54 g/day for MTCA cleanup standards. Thus, Ecology is proposing to make human health WQS more stringent by a factor of between 24 and 41, and to make MTCA cleanup standards more stringent by a factor of between 2.9 and 4.9. Ecology is currently working to revise the SMS rule and anticipates establishing a default FCR for sediment cleanups. Ecology also intends to update Washington's WQS and has stated that the information contained in the TSD and the SMS rule revision "will likely strongly influence the rates included in future human health-based water quality criteria."

Ecology has requested comments on the TSD and the proposed range of default FCRs. NCASI offers the following general comments and answers to questions posed in the TSD.

General Comments

1. Any decision to change the current default FCRs should be justified in terms of overall benefit to public health. The underlying premise of the report is that use of the current default FCRs result in water quality or sediment management standards that are not sufficiently protective. However, the TSD provides no perspective on the degree to which public health is protected under the existing FCRs. More importantly, the TSD provides no basis for gauging the overall benefit to public health that might result from changing these FCRs. Ecology should present a coherent assessment of health risks to the general population of the state represented by the current default FCRs and contrast them with the health risks that would result if the default FCRs were increased as recommended in the TSD. This assessment is imperative as there is currently no viable comparator for the costs that would be borne by both Ecology and the regulated community in responding to lowered sediment and water quality criteria as a result of increased FCRs. Without knowledge of what the benefit might be, it is impossible to determine if these costs would be justified.

Understanding what benefit to public health might result from increasing the FCRs is critically important in this context because the current risk assessment paradigm already results in highly protective environmental standards as a result of multiple conservative assumptions. For example, the calculation of risks resulting from consuming contaminants in fish generally assumes that fish are consumed at the default rate for 70 years, that all fish consumed are contaminated to the same degree (which is functionally equivalent to assuming all fish are from the same body of water), and that there are no losses of contaminants during preparation. Beyond this, the maximum dose of a chemical considered to be safe is always adjusted downward from the level indicated by the toxicological data. In the case of non-cancer endpoints, the product of the multiple safety factors (termed uncertainty or modifying factors) used to develop a reference dose (RfD) can approach well over 1000, meaning that the dose used in a risk assessment could be 1000 times lower than the dose directly indicated by the toxicological data. For carcinogens, this safety factor is typically 10, and the acceptable risk level is typically set at one hypothetical additional cancer case per million lifetimes. This is an exceedingly small incremental risk in light of a current lifetime cancer incident rate due to all causes of about 40% (400,000 in one million)¹. Finally, the paradigm completely discounts any health benefits attributable to consuming fish.

All this supports the current water and sediment quality standards as being highly protective of the residents of Washington, and any proposal to revise these standards should be based on an analysis of the public health benefit to be gained.

2. The proposed range of default FCRs overstates the fish consumption rates for the vast majority of residents of the state. The proposed range is based on high-end statistical consumption rates (e.g., 80th to 95th percentile values) developed from five fish consumption rate studies of known high fish consuming subpopulations. Four of the studies are of tribal groups and the fifth is a study of the King County Asian and Pacific Islander (API) subpopulation. Notwithstanding the methodological concerns we have about Ecology's interpretation of some of these studies (see general comment no. 3), the FCRs recommended in the TSD have the effect of establishing protections for the general population of Washington residents using consumption rates derived from a total surveyed population of 996 individuals reflecting the behaviors of an estimated 0.2-0.9% of the total population of the state.

Studies that apply to general populations suggest that fish consumption rates are considerably lower than Ecology's proposed range. For example, EPA² indicates that for US adults, the 90th and 95th percentile consumption rates of freshwater and estuarine finfish and shellfish are 17.4 and 49.6 g/day, respectively. These values suggest that Ecology's proposed FCR range is not representative of fish consumption rates for the general population statewide.

3. Ecology's analysis of the data from the fish consumption studies used to develop the proposed FCRs is significantly flawed. First, the API study is dominated by first-generation residents (89% of respondents), who are known to consume more fish than later generations.

¹ See, for example, the American Chemical Society at <http://www.cancer.org/Cancer/CancerBasics/lifetime-probability-of-developing-or-dying-from-cancer>

² USEPA. 2002. *Estimated Per Capita Fish Consumption in the United States*.

This known bias in the results casts considerable doubt on the representativeness of the results to describe the fish consumption rates of the broader API population.

Another significant issue with the API study is that the consumption rates used in the TSD to generate a proposed range of FCRs for adoption are not corrected for cooking losses, non-local harvest, or API population demographics. EPA Region 10 reanalyzed these data³, adjusted for these biases, and determined the reasonable maximum exposure (RME, the 95th percentile value) to be 51.1 g/day not including anadromous fish, or 57 g/d including anadromous fish (see table on pg. 61 of TSD). Contrast this with the unadjusted data in the TSD, where the 95th percentile value is shown as 306 g/day (e.g., Table A-1 in TSD). It is unclear why Ecology believes that consumption data biased high by inclusion of non-locally harvested fish should be the basis of its FCR proposal when more scientifically defensible estimates are available. To be clear, any default FCRs should reflect consumption of locally harvested fish only.

It appears that the data from the Tulalip and Suquamish Island tribes also need to be adjusted to remove non-locally harvested fish, as EPA Region 10 did in developing its guidance for site-specific cleanup levels⁴. In addition, Pacific salmon comprised a significant fraction of the fish diet for all the Native American fish consumption studies. For reasons discussed in Appendix A, inclusion of salmon in a statewide default FCR is clearly not appropriate.

Because the actual data from most of the fish consumption surveys are not publically available, Ecology used descriptive statistics to develop composite log-normal distributions based on seven different weighting schemes. (As noted above, these datasets should be adjusted (per EPA Region 10 guidance) to eliminate fish that are not locally harvested before developing composite distributions). Ecology ultimately chose to use a scheme in which each of the five surveys was given equal weight to develop a composite distribution from which the proposed range (80th to 95th percentiles) of FCRs was developed. Given that these data represent only known high fish consuming subpopulations, the use of statistics that characterize the upper extremes (e.g., 80th to 95th percentile values) of a composite distribution that intentionally excludes the vast majority of fish consumers and, more importantly, the vast majority of the general population, would be inappropriate for establishing default FCRs for statewide application. Beyond this, assigning equal weights to each of the five surveys is arbitrary, giving a proposed FCR that is driven by survey results from as few as 50 people (95th percentile of 996 surveyed adults). It would be more defensible to weigh each of these studies according to the estimated total adult populations represented by the underlying data (e.g., per weighing scheme #2 in Appendix C of the TSD), and this process should include the total population of Washington State (with consumption rates taken from EPA^{5,6} or other appropriate studies).

³ Kissinger, L. 2005. *Application of data from an Asian and Pacific Islander (API) seafood consumption study to derive fish and shellfish consumption rates for risk assessment.*

⁴ USEPA. 2007. *Framework for selecting and using tribal fish and shellfish consumption rates for risk-based decision making at CERCLA and RCRA cleanup sites in Puget Sound and the Strait of Georgia.*

⁵ USEPA. 2002. *Estimated Per Capita Fish Consumption in the United States.*

⁶ USEPA. 2011. *Exposure Factors Handbook: 2011 Edition.*

In addition to these general comments, responses to specific questions posed by Ecology in the TSD are provided below. Note that some of these responses draw on information presented in Appendix A, which provides a brief review of what is known about the accumulation of persistent, bioaccumulative, and toxic (PBT) chemicals by salmon.

Responses to Questions Posed by Ecology in the TSD

1. How should default rates take into account the consumption of fish species like salmon that spend much of their life outside of Washington waters?

The consumption of salmon should be excluded from any statewide default FCR. This conclusion is based on review of the scientific literature (Appendix A), which indicates that different species of salmon and different runs of the same species of salmon will accumulate PBT chemicals to differing degrees. In addition, the literature supports the contention that the major fraction of any PBT burden carried by returning adult salmon (i.e., salmon that will be harvested and consumed) is acquired in the open ocean. The fact that resident Puget Sound salmon generally exhibit higher burdens than true open ocean salmon is not inconsistent with this, and simply points out that Puget Sound is a unique habitat (i.e., Puget Sound is not the open ocean).

Because of this, it might be appropriate to assess risk to select Puget Sound residents as a separate activity, and inclusion of salmon in an FCR used in such a risk assessment may well be warranted. However, given that Chinook, Coho, sockeye, pink, and chum salmon are predicted to accumulate different body burdens of PBT chemicals even when they share a common migration corridor, salmon consumption should be apportioned between species, and not simply lumped together as “salmon.” In addition, only salmon harvested directly from Puget Sound should be included in an FCR used for this purpose: ideally, only truly resident salmon (i.e., “blackmouth” salmon) would be included.

2. How should the complex life cycle and biology of the different salmon species be considered when making regulatory decisions?

As noted above, the complexities of salmon biology and/or ecology require that:

- salmon be excluded from any default FCR,
- a site-specific FCR include only “resident” salmon, and only when there are data showing that these salmon are impacted by local sources of chemical contaminants,
- whenever salmon are included in a site-specific FCR, consumption must be broken out on a species-specific basis, and the associated risk assessment must use species-specific chemical concentrations and, when necessary, bioaccumulation factors (BAFs).

3. What is the status of resources pertaining to the harvest of fish and shellfish in Washington?

This question seems irrelevant to the issue at hand.

4. How many people in Washington consume fish? How many people in Washington can be considered high-end fish consumers?

NCASI suggests that assigning individuals to a “consumer” or “non-consumer” category is a false dichotomy, and that it would be more correct to consider fish consumption on a continuum having, essentially, no non-consumers (there are likely to be very few individuals that consume no fish over the course of a lifetime). Thus, according to the TSD, there are 5,143,186 adult consumers of fish in Washington State currently. Beyond this, any categorization of what constitutes “high-end” consumption is unavoidably arbitrary in the sense that it will always be a matter of subjective opinion. This is, and will remain true regardless of statistical categorizations or the overall accuracy or completeness of associated fish consumption data.

5. What are scientifically defensible methods for characterizing fish consumption rates?

A variety of survey methods have been used to generate fish consumption data, as the TSD discusses; each method has both strengths and weaknesses. Regardless, the more important issue is whether the method used accurately captures the consumption habits of the targeted population which, for purposes of establishing default statewide FCRs, should be the population of the entire State of Washington.

Clearly, Ecology has a large body of data characterizing the fish consumption habits of four Puget Sound tribal communities, certain Columbia Basin tribes and the API population residing in King County. Ecology apparently does not have data sufficient to characterize fish consumption by the general population of Washington State to anywhere near the same level of confidence as it has for these very specific subpopulations. This is a critical information gap that must be filled in order to fully understand the risks to public health resulting from the consumption of fish.

6. What is currently known about the fish consumption habits and rates for different fish-consuming populations in Washington?

What is known are the consumption patterns of a few Native American tribes and the API population residing in King County. As a whole, the sampled population represents approximately 311,300 adults (from Table C-2 in the TSD). This number is equivalent to approximately 11% of the adult consumers of purchased fresh fish (as estimated by Washington’s Department of Health, Table 5 in the TSD), approximately 8% of the adult consumers of store-bought fish, and approximately 6% of the general adult population. The TSD provides no details relevant to the consumption habits of the remaining population besides that taken from DOH (e.g., 74% of the general adult population consumes store-bought fish).

7. Would establishing a statewide default fish consumption rate (or rates) be a useful step toward consistency among regulatory programs (for example, MTCA cleanups and water quality-based permitting)?

NCASI notes that statewide default fish consumption rates are already in place for the development of water quality standards (6.5 g/d) and for MTCA cleanups (54 g/d), and Ecology has stated that it intends to adopt a default FCR for sediment management standards (SMS). Thus, any questions regarding the utility of intra-program default FCRs appear to be moot, and

the real question is whether there is a benefit to be had from adopting a single default FCR applicable to all programs. NCASI suggests that the answer to that question is no.

Given the distinctly different scopes and missions of Ecology's different programs (e.g., the MCTA program focuses on cleanup of geographically limited sites posing risk to very specific populations and known to be contaminated with specific chemicals, while the Clean Water Act applies to the whole state regardless of any known source of contamination by any single chemical), it is hard to image that adopting a single default FCR for all programs would actually provide any benefit beyond conceptual simplicity. The validity of this conclusion is best illustrated by the range of FCRs exhibited across different subpopulations and the degree to which these FCRs clearly reflect geographic location. With this last point in mind, the only defensible statewide default FCR for any regulatory program is an FCR reflecting mean consumption by the statewide general population. In situations where subpopulations are believed to be subject to significantly greater risks than the general population (e.g., a subpopulation taking fish from near a MCTA site), an appropriate, risk-based response would be to conduct a population- or site-specific risk assessment⁷ to determine if actual risk (in this case due to a greater than average FCR) for that subpopulation exceeds target values considering all aspects of exposure including, in this case, the health benefits of eating fish⁸.

8. What is an appropriate statewide default fish consumption rate (or rates) given available data, uncertainties and variability in fish consumption habits, and current statutes, regulations, and policies?

As noted, the only defensible statewide default FCR is one that reflects consumption by the general population as a whole (i.e., without attempting to discriminate "consumers" from "non-consumers").

Consistent with this, if Ecology is driven to adopt a single default FCR for use statewide and has no data characterizing fish consumption by the general population of Washington State, it should draw from EPA's data for the general US population⁶. Based on these data, EPA⁹ has concluded that the mean consumption rate of freshwater and estuarine finfish and shellfish by adults (18 and older) is 7.50 g/day. The associated 90th and 95th percentile consumption rates are 17.4 and 49.6 g/d, respectively. Although these FCRs are almost certainly high-biased (i.e., conservative) estimates for the general US population, they provide a much better measure of fish consumption by the general population of Washington State than the range of FCRs proposed by Ecology, which clearly reflects high-end consumers exclusively, and so are preferable for use as default values meant to apply statewide. Using the flexibility afforded under different regulatory programs (MTCA, etc.), adjustments to a "general population" default FCR can then be made using site-specific information, meaning that Ecology can decide to make site-specific standards more protective when circumstances clearly warrant.

⁷ USEPA. 2000. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000).

⁸ Washington Department of Health. 2006. *Human Health Evaluation of Contaminants in Puget Sound Fish*.

⁹ USEPA. 2002. *Estimated Per Capita Fish Consumption in the United States*.

APPENDIX A

A BRIEF REVIEW OF ISSUES RELEVANT TO THE ACCUMULATION OF PERSISTANT, BIOACCUMULATIVE, AND TOXIC (PBT) CHEMICALS BY SALMON

INTRODUCTION

In September 2011 Washington State Department of Ecology (WDOE) issued Publication No. 11-09-050, *Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington*. This technical support document (TSD) was generated to support decision making regarding how to obtain an appropriate fish consumption rate (FCR) for use in calculating water quality standards for protecting human health (HHWQS). One of the issues WDOE raised in this TSD was whether consumption of salmon should be included in whatever FCR is ultimately used in these calculations, and if it is concluded that salmon should be included in an FCR, how to do so.

The driver behind this is human exposure to toxic chemicals, specifically via consumption of fish (or aquatic tissue in general). The greatest risk to human health from consumption of fish is generally understood to result from the presence of persistent, bioaccumulative, and toxic (PBT) chemicals. Thus the primary factor in determining the appropriateness of including consumption of salmon in an FCR is where salmon actually pick up these contaminants. A brief review of what is known about this subject is presented herein.

WHERE SALMON ACCUMULATE PBT CHEMICALS

As discussed by NOAA (2005), different runs of salmon exhibit different life histories. More specifically, NOAA described stream-type and ocean-type life histories. Behavioral attributes of these two general types of salmon are summarized in Table 1.

Table 1. A Summary of the Juvenile Characteristics of Stream and Ocean Life History Types

Stream-Type Fish	Ocean-Type Fish
Species	
Coho salmon	Coho salmon
Some Chinook populations	Some Chinook populations
Steelhead	Chum
Sockeye	Pink
Attributes	
Long period of freshwater rearing (>1 yr)	Short period of freshwater rearing
Shorter ocean residence	Longer ocean residence
Short period of estuarine residence	Longer period of estuarine residence
Larger size at time of estuarine entry	Smaller size at time of estuarine entry
Mostly use deeper, main channel estuarine habitats	Mostly use shallow water estuarine habitats, especially vegetated ones

[SOURCE: NOAA 2005]

From Table 1, different species of salmon and different runs of the same species can exhibit distinctly different life histories, including how much time is spent in freshwater and where in

freshwater systems this time is spent. These differences are potentially significant in that they may lead to differences in the mass (burden) of chemical contaminants (e.g., PBT chemicals) ultimately accumulated by the salmon, and in the fraction of this ultimate burden accumulated in freshwater vs. saltwater. Although the latter may not be relevant when assessing the risk to human health resulting from eating contaminated fish in general, it is relevant when considering what fraction of this overall risk results from accumulation of contaminants in freshwater systems vs. saltwater systems.

This last point is directly relevant to the question of whether there is any utility in including consumption of salmon in an FCR that will be used to drive remedial action(s) on the geographically limited scale of a single state. If a significant fraction of the contaminant burden found in salmon is accumulated in true freshwater systems it makes sense that the consumption of salmon be included in an FCR. However, if accumulation in the open ocean dominates, inclusion of salmon in an FCR makes no sense because there is no action the state can take that will have a significant effect on the contaminant burden found in returning adult salmon.

Exclusion of salmon from an FCR does not imply that human exposure to contaminants due to consumption of salmon should not be accounted for when assessing overall risks to human health. Instead, these issues should be weighed when deciding whether salmon are accounted for when assessing the risks resulting from consumption of freshwater fish (by including consumption of salmon in an FCR) or when assessing the risks resulting from consumption of saltwater or marine fish (salmon would be backed out of the risk assessment for deriving a freshwater HHWQS via the relative source contribution or RSC). Ultimately, the issue of where the risks from consumption of salmon are counted appears to be an academic question. The more important factor (from the perspective of characterizing risk) is to ensure that consumption of salmon is not double counted by including it in both an FCR **and** as a component of the RSC.

In any case, the issue of salmon (or anadromous fish in general) is unique in that it is quite likely that a generic salmon will accumulate contaminants in both freshwater and saltwater habitats, and that the relative fraction accumulated in one habitat vs. the other will vary with species, run, and even individual. Taken to the extreme, this implies that each run needs to be evaluated independently to determine where contaminants are accumulated. However, much of the scientific literature supports accumulation in the open ocean as the dominant pathway for uptake of PBT chemicals by salmon, with the work of O'Neill, West, and Hoeman (1998), West and O'Neill (2007), and O'Neill and West (2009) providing perhaps the most thorough examination of the issue.

Figure 1 is taken from O'Neill and West (2009) and shows that levels of polychlorinated biphenyls (PCBs) in adult Chinook salmon (fillets) collected from a wide range of geographic locations are relatively uniform except for fish taken from Puget Sound, which show three to five times higher levels of PCBs than fish taken from other locations. As discussed by the authors, these data can be interpreted as indicating accumulation of PCBs in Puget Sound and/or along the migratory routes of these fish, which, depending on the specific runs, can pass through some highly contaminated Superfund sites (e.g., Duwamish Waterway). However, O'Neill and West (2009) concluded that, on average, >96% of the total body burden (mass) of PCBs in these Puget Sound Chinook was accumulated in the Sound and not in natal river(s).

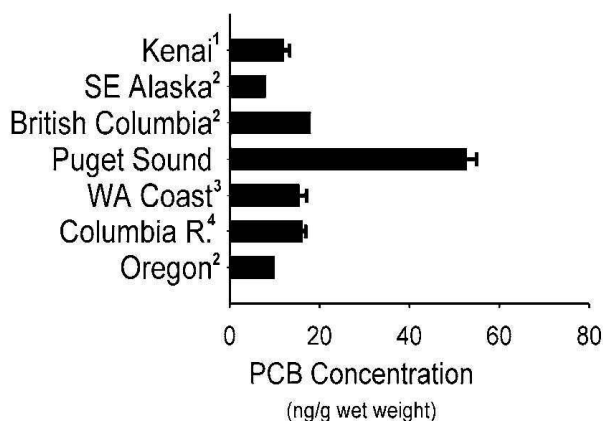


Figure 1. Average (\pm SE) PCB Concentration in Chinook Salmon Fillets

Data for Puget Sound were based on 204 samples collected by the Washington Department of Fish and Wildlife from 1992 to 1996; data for other locations were taken from the following (indicated by superscript numbers): ¹Rice and Moles (2006), ²Hites et al. (2004; estimated from publication), ³Missildine et al. (2005), and ⁴United States Environmental Protection Agency (USEPA 2002)

[SOURCE: O'Neill and West 2009]

The basis for this conclusion is presented in Table 2, which compares PCB concentrations and body burdens in out migrating Chinook smolts collected from the Duwamish River and adults returning to the Duwamish.

TABLE 2.—Concentration of PCBs (ng/g) and body burden of PCBs (total ng/fish) in out-migrating Chinook salmon smolts and returning adults from the contaminated Duwamish River, Washington.

Variable	Smolts	Adults
Number of samples	80	34
Mean fish weight (g)	10	6,000
Whole body PCB concentration (ng/g) ^a		
Mean	170	57
95th percentile	860	88
PCB body burden (ng/fish) ^a		
Mean	2,100	350,000
95th percentile	9,200	800,000
Mean % of PCB body burden from the most contaminated smolts ^b	—	3.8

^a Values for smolts are from J. P. Meador (National Oceanic and Atmospheric Administration Fisheries, Northwest Fisheries Science Center, personal communication); values for adults were estimated from measured muscle tissue concentration using the fillet-whole-body regression (see Methods) for PCBs.

^b Contaminant data were only available for out-migrating subyearling smolts, so only samples with adults that went to sea as subyearlings were included in the analysis.

[SOURCE: O'Neill and West 2009]

These data show that even the most contaminated out migrating smolts contained no more than 4% of the body burden (mass) of PCBs found in returning adults. Thus, >96% of the PCB mass (burden) found in the returning adults was accumulated in Puget Sound. Even allowing for an order of magnitude underestimate in the body burden of out migrating smolts, O'Neill and West (2009) concluded that accumulation in freshwater would account for <10% of the average PCB burden ultimately found in adults returning to the Duwamish. By extension, this analysis supports the conclusion that Chinook salmon passing through uncontaminated estuaries during out migration accumulate a dominant fraction of their ultimate PCB body burdens in the open ocean. Other researchers have also reached this conclusion using their own data (e.g., Johnson et al. 2007; Cullon et al. 2009).

However, this analysis does not explain why Chinook salmon collected in Puget Sound exhibit higher concentrations of PCBs than Chinook salmon collected from other locations (Figure 1). Ultimately, O'Neill and West (2009) attributed this to a combination of factors, specifically PCB contamination of the Puget Sound food web (e.g., West, O'Neill, and Ylitalo 2008) combined with a high percentage of Chinook displaying resident behavior. That is, a large fraction of out migrating Chinook smolts take up permanent residence in the Sound, where they feed from a more contaminated food web than found in the open ocean. These factors would not affect Chinook runs or runs of any other species associated with natal rivers that discharge to saltwater outside Puget Sound.

Overall, these data support the position that, as a general rule, the predominant fraction of the ultimate PCB burden found in harvested adult fish is accumulated while in the ocean-phase of their life cycle (e.g., Cullon et al. 2009; Johnson et al. 2007; O'Neill and West 2009). Although this conclusion is specific to PCBs, there is no reason to suppose that it would not also hold for other legacy PBTs (e.g., DDT, dioxins) or globally ubiquitous PBTs (e.g., PBDEs, methylmercury) in general (e.g., Cullon et al. 2009). Because concerns about human consumption of fish are driven by risks from exposure to PBTs, driving the FCR higher by including salmon would thus appear to be of limited utility from the perspective of protecting human health simply because these contaminants are accumulated in the ocean.

With that said, there are sufficient data to conclude that the food web in Puget Sound is contaminated with PCBs to a greater degree than the food web in the open ocean. To the extent that this is a result of true local sources (e.g., sediment hotspots), there may in fact be some "local" action that can be taken to reduce PCBs, or potentially other PBTs, in Puget Sound salmon. However, this is totally dependent on identification of localized sources amenable to remediation, and not simply a conclusion that the food web is contaminated (e.g., West and O'Neill 2007).

Again, simply increasing the FCR by including salmon will have essentially no positive effect on human health given that the dominant fraction of PBT body burdens in salmon appears to be accumulated in the open ocean, and not in waters immediately subject to in-state loadings.

PBT ACCUMULATION BY DIFFERENT SALMON SPECIES

As discussed, there is ample evidence that the body burdens of PBTs found in returning adult Chinook salmon depend to a significant extent on the life history of the specific run. Beyond this, there are interspecies differences in migratory and feeding behavior that suggest Coho, sockeye, pink, and chum salmon will not accumulate PBTs to the same extent as Chinook

salmon under similar exposure scenarios (Groot and Margolis 1991; Higgs et al. 1995). Perhaps the most significant factor differentiating Chinook from the other salmon species is that Chinook tend to eat more fish (Higgs et al. 1995). Thus they effectively feed at a higher trophic level than the other species of salmon, and would be expected to accumulate greater burdens of PBT chemicals even when sharing the same habitat. This is in fact observable. For example, when looking at adult Chinook and Coho returning to the same rivers, O'Neill, West, and Hoeman (1998) found that Chinook muscle contained, on average, almost twice the total PCB concentrations found in Coho muscle. This was also true for adults collected in Puget Sound proper (O'Neill, West, and Hoeman 1998).

Differences between species can also manifest in sub-adults. For example, Johnson et al. (2007) reported Σ PCB concentrations in juvenile wild Coho collected from five different estuaries ranging from 5.9 to 27 ng/g (wet weight; whole body minus stomach contents). The corresponding range for wild Chinook juveniles collected from the same estuaries was 11 to 46 ng/g (wet weight; whole body minus stomach contents). Overall, PCB concentrations in juvenile Coho were, on average, equivalent to nominally 50% of those found in the paired Chinook juveniles. This is essentially the same ratio observed by O'Neill, West, and Hoeman (1998) in adult fish.

All this indicates that PBT residues in salmon will vary within species depending on the specific run, and between species regardless (i.e., even when different species share the same general habitat). Thus, grouping all salmon together does not provide an accurate assessment of PBT doses delivered to human consumers due to consumption of salmon. This suggests that human health risk assessments should, as a general rule, incorporate salmon on a species-specific basis, if not a run-specific basis.

Certainly, none of this is supportive of adopting a single default value for the dose of any contaminant received by humans via consumption of salmon. Thus adoption of a single default FCR for salmon is also not supported.

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King County

Department of Natural Resources and Parks

Director's Office
King Street Center
201 South Jackson Street, Suite 700
Seattle, WA 98104-3855

January 13, 2012

Martha Hankins
Toxics Cleanup Program
Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Dear Ms. Hankins:

Thank you for the opportunity to provide comments on the Washington Department of Ecology's (Ecology) *Fish Consumption Rates – Technical Support Document*. King County shares Ecology's long-term interest in protecting human health and believes Washington State's existing default fish consumption rates are inconsistent and outdated. Our state's marine and freshwater fisheries are of great ecological, social, cultural, and economic importance. King County strives to protect fish health and habitat, in part, so that fish and shellfish collected from waterbodies within King County can be safely consumed. Therefore, King County agrees that default fish consumption rates should be updated to be more representative of Washington resident fish consumers.

King County applauds Ecology's launch of a review process for the Sediment Management Standards (SMS) rule, Washington Water Quality Standards for Surface Waters, and the Model Toxics Control Act (MTCA) Cleanup Regulation. As you know, King County is actively involved in sediment cleanup in the Lower Duwamish Waterway and water quality monitoring through our countywide ambient monitoring program and various National Pollutant Discharge Elimination System permits. King County would support any changes to these rules and regulations that improve implementation and coordination between programs and provide standards for assessing biological resources and human health in marine and freshwaters. This letter provides the King County Department of Natural Resources and Parks specific comments associated with the *Fish Consumption Rates – Technical Support Document*.

King County agrees that the recommended 157–267 gm/day consumption range characterizes the upper percentiles of “high end seafood consumer” exposure. However, we believe that values in this range are not applicable for all waterbodies on a statewide basis as elaborated below. We also have concerns regarding the technical feasibility of implementing these rates that will ultimately need to be addressed.

Comments on the Technical Document, concerning the approach used to derive these values and how various consumption rates might be derived and applied statewide, are presented below.

1. King County encourages inclusion of general population seafood consumption surveys for self-harvested and locally caught seafood purchased in local markets to describe the level of protectiveness provided by the proposed consumption rates to all Washington citizens.
2. Details of the 1991 Commencement Bay survey, which are the basis for the current MTCA default consumption rate of 54 grams/day, are not provided in the document. The data contained in this survey were also not included in the statistical analysis conducted to develop the proposed range of consumption rates. We recommend that Ecology provide more information about this general recreational consumption survey and describe why these data were not included alongside the cited tribal and API survey details.
3. The selected API consumption survey appears to include fish and shellfish which were store-bought and not sourced locally (e.g., tuna). King County believes data for nonlocal store-bought fish like tuna, or tropical species, should be removed from the API dataset and the distribution of the remaining locally sourced fish and shellfish used instead. We recommend that this issue be addressed and clarified in the document and the statistical analysis is re-evaluated to develop consumption rates reflecting self-harvested and locally sourced seafood purchased in local markets. Consumption rates forming the basis of Washington water quality and sediment management standards should not include nonlocal seafood.
4. Ecology has specifically requested feedback on the inclusion of salmon consumption in the proposed consumption rates. Marine shellfish data and salmon have been included in the proposed rate to be applied to all water bodies, even those where these species are not present. King County recommends that Ecology consider the presence of salmon and shellfish when selecting consumption rates for different waterbodies. To address the problem of including salmon and shellfish ingestion as part of the effort to protect, restore, or remediate waters and sediments where suitable habitat for these organisms does not exist, King County proposes that Ecology develop three consumption rates:
 - a. A rate for use in marine and coastal estuarine waters where anadromous adult salmon and the typical suite of crab and shellfish species would be expected.
 - b. A rate for the Columbia River and major tributaries, along with lakes where Kokanee are present.
 - c. A rate for streams and lakes which only serve as migration corridors for migratory salmon or where salmon or shellfish are absent.
5. King County is concerned that the proposed consumption rates may exceed sustainable harvest levels in some cases. In particular, small streams and lakes are unlikely to sustain harvest rates of 157–267 grams/day. King County encourages Ecology to work with fisheries managers and consider sustainable harvest rates in setting criteria for a specific waterbody.
6. The document discusses the issue that contaminants in salmon are in part derived from oceanic waters outside the influence of Ecology's regulatory programs or potential contaminant sources in Washington. King County agrees with this conclusion. However, the source of contaminants in any particular fish or shellfish tissue does not change the rate at which people consume those species, notwithstanding fish and shellfish advisories or other factors leading to consumption

suppression. King County believes the most appropriate way to address the issue of contaminant sources is through site-specific study to understand contaminant sources and fish habitat usage. King County believes that distinguishing locally sourced contaminants from oceanic contaminant sources in particular fish or shellfish is best done at the waterbody, species, and contaminant specific level.

King County recognizes that the purpose of the new default fish consumption rate is to estimate exposures from individual waterbodies. Because it is unclear how the requested recalculations described above may influence conclusions about differences in exposure, King County requests that Ecology reissue the technical document with these issues addressed.

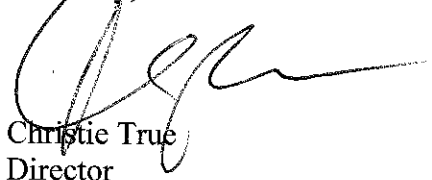
King County also recognizes that significant regulatory compliance and implementation issues may arise from incorporating the proposed fish consumption rates in revisions to water quality standards, sediment quality standards, and MTCA. In particular, using significantly higher fish consumption rates will result in the technical infeasibility of meeting these standards in numerous locations for some common contaminants.

Since the details of these implementation concerns and the possible technological barriers to water quality permit, SMS, and MTCA compliance are unknown at this time, King County will be commenting on those rulemaking changes and efforts when they are issued. It also raises the fact that alternative approaches to meeting water quality and public health objectives will likely be required. King County would like to work together with Ecology and other stakeholders in developing these important policies.

Thank you for the opportunity to comment on the scientific basis for establishing statewide fish consumption rates protective of high end consumers. We look forward to continuing to work together with Ecology, the Washington Department of Health and others to make them both scientifically sound and clearly implementable.

If you have any questions, contact Dave White, Science and Technical Support Section Manager, at 206-296-8243.

Sincerely,



Christie True
Director

cc: Mark Isaacson, Division Director, Water and Land Resources Division, Department of Natural Resources and Parks (DNRP)
Pam Elardo, Division Director, Wastewater Treatment Division (WTD), DNRP
Dave White, Manager, Science and Technical Support Section, WTD, DNRP
Melissa Gildersleeve, Watersheds Coordinator, Department of Ecology
Jim Pendowski, Program Manager, Toxics Cleanup Program, Department of Ecology



Northwest Pulp & Paper Association
212 Union Ave SE, Suite 103
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VIA E-MAIL

January 17, 2012

Mr. Ted Sturdevant
Director
Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Re: NWPPA comments on Ecology's "Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington", Publication No. 11-09-050

Dear Director Sturdevant:

On behalf of the Northwest Pulp and Paper Association (NWPPA), we respectfully submit for your review and response the following comments to the above-referenced Publication.

The NWPPA is a 56-year old regional trade association representing eight (8) member pulp and paper mills in Washington State. Our members currently employ approximately 4,000 people in Washington State. The average pulp and paper mill worker compensation is over \$65,000 annually, plus benefits. These are predominately union-represented jobs that provide family-wage employment. Many of these jobs are located in rural communities, faced with the highest unemployment rates in the state. These high-wage manufacturing jobs support a 3-to-1 job multiplier, and even higher in rural communities. Until recently, Washington had shrunk to only 12 pulp and paper mills operating in the state. That number now stands at 11 with the recent announcement by Kimberly Clark that it will close its facility in Everett, costing approximately 700 family-wage jobs.

The pulp and paper sector operates in a highly competitive global market; overseas competition has significant cost advantages. As one of the most highly regulated, point-source discharge industries in the state and country, the pulp and paper sector is greatly affected by new water quality regulations and standards. Existing and new regulations, particularly during these extremely difficult economic times, affect the bottom line and make it that much more difficult for our members to retain existing jobs, not to mention

creating new ones. For these reasons, NWPPA has great interest and concern with this issue.

When the Publication became available for public review, NWPPA contacted the National Council for Air and Stream Improvement (NCASI) and asked them to review Ecology's recommendations on a technical and scientific basis, and address the questions raised therein. NCASI is an independent, nonprofit organization that provides technical support to the forest products industry on an array of environmental issues.

Attached hereto is a copy of NCASI's comment letter, dated January 11, 2012, which has been filed separately in this matter. As you'll see, NCASI offers the following summarized observations:

1. Any decision to change the current default fish consumption rates (FCRs) should be justified in terms of *overall* benefit to public health.
2. The proposed range of default FCRs overstates the fish consumption rates for the vast majority of residents in Washington State.
3. Ecology's analysis of the data from the fish consumption studies used to develop the proposed FCRs is significantly flawed.

It is our understanding that once Ecology reviews the comments to this Publication, it will decide on an FCR ranging between 157 and 267 grams per day and then use that rate in its current rulemaking process updating the Sediment Management Standards (SMS) under WAC 173-204. We also understand that the FCR ultimately adopted in the SMS rulemaking will be consistent with the FCR adopted in the 2013 triennial review of the human health-based water quality criteria in WAC 173-201A, *Water Quality Standards for Surface Water Bodies*.

The NCASI analysis raises important questions about the limitations of scientific information available to Ecology, the agency's statistical evaluation of available FCR information, and the extension of that evaluation into the water quality standards rulemaking process.

This is very important work. Ecology's policy choices with the use of an FCR in surface water quality and sediment management standards will hold great public interest and have significant cost implications to public and private entities who require NPDES permits authorizing wastewater discharges, or hold potential liable party status for legacy contamination of sediments. Similarly, these policy choices and regulatory outcomes have the potential to be very resource intensive for the Department of Ecology and other state agencies to implement any comply with. Finally, the ability to attract new industrial and commercial development in the state, and to construct the public infrastructure to support that growth, might well be affected by the outcomes of this current regulatory process.

It is for these reasons that we believe and insist that Ecology must review, consider and respond in writing to the NCASI comments – and all other comments – received from

stakeholders during the comment period. Any decision made by Ecology must be made based on sound science. If this process is not based on a sound scientific and technical review, it will undermine the credibility of the entire process.

NWPPA looks forward to a productive working relationship with Ecology as this process moves forward. Please do not hesitate to contact us with any questions or assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "Christian M. McCabe". The signature is fluid and cursive, with the first name "Christian" being more prominent than the last name "McCabe".

Christian M. McCabe
Executive Director
Northwest Pulp & Paper Association

Attachment (1): NCASI comments of January 11, 2012.

Cc: Steve Stratton, NCASI West Coast Regional Manager
Keith Phillips, Governor Gregoire's Executive Policy Office
Jim Justin, Governor's Legislative Director
Senator Lisa Brown
Senator Mike Hewitt
Representative Frank Chopp
Representative Richard DeBolt



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January 17, 2012

Sent by Electronic Mail to: Ted.Sturdevant@ecy.wa.gov
fishconsumption@ecy.wa.gov

Ted Sturdevant
Director, Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-47600

Dear Director Sturdevant:

This letter conveys the Weyerhaeuser Company comments on the Department of Ecology's "*Fish Consumption Rates – Technical Support Document: A Review of Data and Information About Fish Consumption in Washington*," September 2011.

Review of this Technical Support Document (hereafter, "TSD") reveals that Ecology and the list of contributors have made a significant and sincere contribution to determining how much fish and shellfish are consumed by high-consuming population groups in Washington state. Thank you for sponsoring this effort and for providing an opportunity to review this TSD product.

The questions around how much fish/shellfish Washington state residents consume, and how that consumption should be accounted for in environmental regulations designed to protect public health, is complex. While the review of this TSD represents the first opportunity to engage on a science and risk management level, it will be the subsequent use of the Fish Consumption Rate (hereafter, "FCR") in Sediment Management Standards (WAC 173-204), Surface Water Quality Standards (WAC 173-201A) and, ultimately, in the Model Toxics Control Act (WAC 173-340), where the very significant public policy implications of this work will be manifested. Ecology is surely aware of this and should commit throughout these upcoming regulatory processes to examine outcomes broadly and with a long-term perspective. Any amendment of these environmental regulations will trigger separate Significant Legislative Rule evaluations (RCW 34.05.328). Ecology's diligent response to each statutory element of the SLR can serve to inform both the state Legislature and Washington residents on the long-term implications of FCR choices. The importance of Ecology's completing high quality, comprehensive and timely SLR processes cannot be overstated.

The Department of Ecology contends that “available scientific studies support the use of a default fish consumption rate in the range of 157-267 grams per day (g/day).” The agency indicates that a FCR drawn from this range will be based on “scientific information, informed by risk management decisions, and reflect state and federal law and policy.” Weyerhaeuser disagrees, in part, with Ecology’s FCR recommendation. Our comments are categorized as Technical/Science and Regulatory Policy.

Technical/Science

1. Weyerhaeuser endorses comments being submitted on this FCR/TSD by the NCASI, January 11, 2012¹.
2. A paper titled “*Evaluation of the Fish Consumption Rate Selected by Oregon DEQ for the Development of Ambient Water Quality Criteria*,”² to the extent it addresses the experience with and limitations of fish consumption surveys, the references to and results of other regional fish consumption surveys (especially, Rupp, et al. (1980)), and then the discussion on the conservatism in the use of information to derive human health-based water quality criteria (presented on pages 5-8 of the AMEC paper but not repeated here).
3. Selecting a default FCR at the “ceiling” of fish consumers and basing statewide regulatory standards on that value, versus considering a “floor” FCR value, is a major issue. We note, for example, that the EPA has selected a default fish consumption rate for the general population of 17.5 grams/day, which represents an estimate of the 90th percentile consumption rate for the U.S. adult population.³ An appropriate default FCR range for Washington should certainly be expanded to include 17.5 grams/day. EPA guidance allowing for variable population-based risk protection levels and/or the possibility of site-specific water quality criteria, provide flexibility in deciding on compliant and protective regulatory standards.

The NCASI and (less directly) the AMEC submittals raise fundamental science and risk management policy concerns with Ecology’s preliminary FCR. We expect others commenting on this FCR/TSD will raise similar concerns. Confidence with the scientific basis for the FCR recommendation is essential for gaining public support and crucial for reaching defensible and reasonable regulatory outcomes in subsequent rule-making actions. Although admittedly not typical of guidance documents, Weyerhaeuser’s request is that Ecology respond in writing to the substantive science/technical and risk management issues that are presented. An incomplete exchange on science/technical questions now will simply move the issues into the next phase of the upcoming administrative/rule development processes.

¹ The National Council for Air and Stream Improvement, Inc. (NCASI), is an independent, nonprofit membership organization providing technical support to the forest products industry

² AMEC, May 2003, enclosed

³ “Methodology for Deriving Ambient Water Quality for the Protection of Human Health (2000),” Environmental Protection Agency, EPA-822-B-00-004, October 2000

Regulatory Policy/Risk Management

The agency will ultimately be accountable for responding to comments on regulatory policy choices, but those are a ways into the future when the Significant Legislative Rule materials and proposed regulation amendments are prepared. Nonetheless, early identification of the more prominent regulatory policy issues might provide some “heads-up” value as Ecology works through the administrative processes.

1. Ecology must be prepared to communicate about human health risk factors faced by Washington state residents. This will be necessary to provide context and perspective for any Clean Water Act regulation amendments tied to FCR changes. The NCASI comment letter says it well and simply: “Any Decision to change the current default FCRs should be justified in terms of overall benefit to public health.” Ecology will need to describe the theoretical incremental health benefits expected if 267 grams/day FCR is selected for regulatory standards development...or 157 grams/day...or 17.5 grams/day. How do those theoretical benefits compare to other human health risk factors experienced by Washington residents? What health benefits would the population forgo if more stringent CWA standards serve to discourage consumption of fish/shellfish?
2. Ecology should be prepared to delete WAC 173-201A-240(6), requiring risk-based criteria for carcinogenic substances selected to ensure the excess cancer risk is less than or equal to one-in-a-million. The EPA explains that human health-based ambient water quality criteria tied to a 10⁽⁻⁵⁾ to 10⁽⁻⁷⁾ risk level are acceptable for the general population as long as the risk to more highly exposed subgroups (sportsfishers or subsistence fishers) does not exceed 10⁽⁻⁴⁾⁴. To avoid absurd regulatory outcomes, Ecology will clearly need flexibility to consider a broad risk range.
3. The value of a “default” FCR for Sediment Management Standards is not apparent. Sites will have unique features. Skilled government agency personnel and environmental consultants seem very capable to work in the RI/FS and CAP development process to derive a customized FCR for the specific contaminated site.
4. Ecology needs to avoid absurd regulatory outcomes in these upcoming regulation development activities. Selecting a FCR which ultimately yields human health-based water quality criteria or sediment management standards to levels below natural background concentrations is not good.
5. Lawful and efficient regulatory mechanisms need to be identified and promoted to allow wastewater dischargers and PLPs to be confidently compliant with the Clean Water Act, assuming good faith efforts and application of AKART. The Department of Ecology needs to demonstrate competence and a willingness to employ these mechanisms to achieve rational outcomes.

⁴ Ibid, EPA-822-B-00-004

Weyerhaeuser understands and fully supports the Department of Ecology's obligation to establish and implement regulatory requirements which are protective of Washington residents. We look forward to participating in rule-making activities to ensure this objective is accomplished with outcomes that are reasonable and practical.

Sincerely,

A handwritten signature in black ink, appearing to read "Ken Johnson", written in a cursive style.

Ken Johnson
Corporate Environmental Manager

**Evaluation Of The Fish Consumption Rate Selected By Oregon DEQ
For The Development Of Ambient Water Quality Criteria**

Submitted to

Northwest Pulp and Paper Association
1300 114th Avenue, SE #200
Bellevue, WA 98004

Prepared by:

Ellen S. Ebert
AMEC Earth & Environmental
15 Franklin Street
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Paul Anderson
AMEC Earth & Environmental
239 Littleton Road
Westford, Massachusetts 01886

May, 2003

EVALUATION OF THE FISH CONSUMPTION RATE SELECTED BY OREGON DEQ FOR THE DEVELOPMENT OF AMBIENT WATER QUALITY CRITERIA

Oregon DEQ has proposed that a fish consumption rate of 17.5 g/day be used to establish Ambient Water Quality Criteria (AWQC) for Oregon's fresh waters. This consumption rate is an estimate of the 90th percentile per capita rate of consumption of freshwater and estuarine finfish and shellfish by the general population of United States, based on the USDA's CSFII data. It is recommended by EPA (2000) as a default fish consumption rate to represent the consumption of fish by the general population and sport anglers when deriving AWQC. Its selection as the basis for AWQC in Oregon is very conservative for several reasons. First, the data upon which it is based are not representative of the population of interest in that they include many types of prepackaged and imported fish that are not derived from local water bodies. Second, the use of short-term dietary recall data to estimate long term consumption rates for any population results in biased and high uncertain estimates. Finally, the conservatism in the selected fish consumption rate, along the numerous other conservative assumptions included in the derivation of the AWQC, ensures that the AWQC will be protective of high-end consumers.

Estimated Consumption Rates Based on USDA Data Are Highly Uncertain

Consumption rates that are based on USDA dietary data are highly conservative when applied to Oregon's AWQC methodology for a number of reasons. First, the data collected are not focused on the population of interest, i.e., individuals who consume freshwater fish from Oregon's ambient waters, and include many other types of fish. Second, the USDA rates, which are based on short-term dietary recall data collected from the general population of the U.S., overestimate long-term consumption for high-end consumers and underestimate it for "non-consumers", resulting in a high level of uncertainty in the estimates. However, available data can be used to evaluate the validity of the specific assumption of 17.5 g/day that is being proposed by DEQ.

Population of Interest for AWQC

The population of interest for the development of Oregon's AWQC are those individuals who consume freshwater fish obtained from Oregon's ambient waters. These include members of the general population of Oregon who purchase freshwater fish that has been obtained from commercial freshwater fishing sources in the state, sport anglers who catch their own fish, and Native American tribes who obtain fish through their commercial or recreational activities. The USDA data do not provide specific information about recreational or Native American populations. In addition, while EPA (2000) reports the results of USDA survey for consumers among the general population, it is not representative of all consumers within the population and does not provide information about freshwater fish only. Instead, results are presented for "freshwater/estuarine" fish and shellfish, which include many species and meals of fish that would not be found in the water bodies that will be subject to the AWQC. Furthermore, the USDA data include fish meals that are obtained from numerous sources. These include fresh, frozen and canned fish products that have been produced in other regions of the United States or imported from other countries and are not derived from local water bodies. Thus the USDA data overestimate the consumption of locally caught fish and certainly overstate consumption from individual water bodies that are regulated under the AWQC.

Limitations of the Use of Short-Term Dietary Data for the General Population

The USDA dietary data do not provide a strong basis for estimating a long-term fish consumption rate to be used in developing the AWQC because of the way that the data were collected. This is particularly problematic when one attempts to use them to estimate high-end consumption rates.

The USDA dietary data were collected from survey participants during two non-consecutive 24-hour periods (EPA, 2000). Because of the way in which sampling was conducted, the actual fish consumption behaviors reported are strongly biased toward those respondents who consume fish with a high frequency. All of the individuals included as fish consumers in the USDA estimate consumed fish at least once during the 2-day sampling period. To use these data to estimate long-term consumption rates, it is necessary to assume that the consumption behavior that occurred during the 2-day period is the same as the consumption behavior that occurs throughout every other 2-day period during the year. Thus, if an individual reported eating one fish meal during the sampling period, the extrapolation necessary to estimate long-term consumption requires the assumption that the individual continues to eat fish with a frequency of once every two days, or as many as 183 meals per year. If it is assumed that an individual eats one-half pound (227 g) of fish per meal, this results in a consumption rate of 114 g/day. However, the individual who consumed fish during that sampling period may not actually be a regular fish consumer. In fact, that fish meal could have been the only fish meal that the individual consumed in an entire year. Thus, that person's fish consumption rate would be substantially overestimated. Unfortunately, because of the way that the USDA data are collected, there is no way to determine if the behaviors reported by survey respondents during the sampling period are representative of their long-term behaviors. Thus, for the "consumers" in the population who were reported in these data, the reported consumption rates must have a minimum of one meal every two days.

Conversely, individuals who did not consume fish during the 2-day sampling period were assumed to be non-consumers of fish when instead those individuals may have been fish consumers who coincidentally did not consume fish during the 2-day sampling period. Because there are no data upon which to base consumption estimates for these individuals, they must be assumed to consume 0 g/day. However, they may in fact consume fish with a frequency ranging from as little as zero meals per year to as much as one meal per day (or even more than one meal per day) on all days except the two that USDA conducted the survey. As with the high consumers identified in the USDA database, there is no way to determine whether 0 g/day consumers are actually non-consumers or just individuals who consume with less frequency than once every two days.

To demonstrate the effect that length of sampling period can have on resulting fish consumption rates, one can compare the findings of other short-term dietary studies with long-term studies. For example, another USDA survey reported by Mertz and Kelsay (1984) asked 29 people to track the types and amounts of food they ate for a one-year period. Because the daily dietary records kept by the study subjects can be condensed into 52 discrete one-week periods, it is possible to investigate the relationship between annual and weekly average fish consumption rates. The mean yearlong fish consumption rate from the Mertz and Kelsay (1984) survey data can be estimated by summing the entire quantity of fish consumed by each survey respondent during the year and dividing by 365 days. The mean per capita "365-day" fish consumption rate developed using this approach is 26 g/day. In addition, the mean daily fish consumption rate

averaged over a one-week period, the "7-day" fish consumption rate, is estimated to be 26 g/day. Thus, the mean per capita consumption rate does not appear to be affected substantially by the recall period, suggesting that the per capita mean is a fairly robust and meaningful measure of the average consumption rate, regardless of the length of the survey period.

The same cannot be said, however, of the upper percentiles of the fish consumption rate distribution. When comparing the 7-day intake rates collected by Mertz and Kelsay (1984) with the 365-day intake rates, the upper percentiles are very different. For example, when looking at the 7-day intake rates, the maximum value reported is 228 g/day. However, when the 365-day averages are developed, by combining all of the 7-day periods throughout the year, the maximum consumption rate is 78 g/day. Thus, the short-term estimate overstates the actual long-term maximum by a factor of three. Similarly, when comparing the 95th percentiles reported for these two periods, the 7-day daily average (87.71 g/day) substantially overestimates the 365-day daily average (51.13 g/day) by 72 percent, again demonstrating that the 7-day recall period does not provide a reliable surrogate for long-term consumption behavior at the upper end of the distribution. It is very likely that extrapolating results from a 2-day sampling period would further overestimate long-term behavior.

This problem has also been demonstrated and discussed by Ebert et al. (1994) who compared reported rates of self-caught fish consumption based on the duration of the recall period. Ebert et al. reported that when a one-day recall period was used by Pierce et al. (1981) and Puffer et al. (1981), "high-end" (95th percentile) intakes ranged up to 339 g/day for consumers. When Pao et al. (1982) used a 3-day recall period, the 95th percentile intake for consumers was reported to be 128 g/day. Using a 30-day recall period, Javitz (1980) reported a 95th percentile intake of 42 g/day, and when a recall period of one year (365 days) was used (Fiore et al., 1989; Ebert et al., 1993), the 95th percentile estimates for sport-caught fish consumers ranged from 26 to 37 g/day.

EPA (1997; 1998a, p. 108) has acknowledged that short-term dietary records are problematic when attempting to estimate long-term rates of consumption. In its review of fish consumption studies for the *Exposure Factors Handbook*, EPA (1997, p. 10-13) stated, "the distribution of average daily intake reflective of long-term consumption patterns cannot in general be estimated using short-term (e.g., one week) data." Specifically in its discussion of the limitations of the West et al. (1993) study of Michigan sport anglers, which used a one-week recall period, EPA (1997 pp. 10-16 to 10-17) stated that "since this survey only measured fish consumption over a short (one week) interval, the resulting distribution will not be indicative of the long-term fish consumption distribution and the upper percentiles reported from the EPA analysis will likely considerably overestimate the corresponding long term percentiles. The overall 95th percentile calculated by U.S. EPA (1995) was 77.9; this is about double the 95th percentile estimated using year long consumption data from the 1989 Michigan survey." In addition, when discussing the USDA methodology, EPA (1998a, p. 106-107) stated that "[t]he non-consumption of finfish or shellfish by a majority of individuals, combined with consumption data from high-end consumers, resulted in a wide range of observed fish consumption. This range of fish consumption data would tend to produce distributions of fish consumption with larger variances than would be associated with a longer survey period, such as 30 days."

While the USDA data are associated with a high level of uncertainty due to the substantial biases introduced by the use of short-term dietary data, the evaluation of the work by Mertz and Kelsay, indicates that the arithmetic mean "per capita" estimate of 17.5 g/day, being proposed

by DEQ, is a conservative but supportable estimate of consumption by the target population. In addition, a review of longer term and more relevant data indicates that the proposed rate of 17.5 g/day is reasonable for use in developing Oregon's AWQC.

In the results provided by Rupp et al., average consumption rates over the entire population were provided along with the numbers of surveyed individuals who actually consumed each type of fish in each region. According to Rupp et al. (1980), a total of 2,141 adults were surveyed in the Pacific region, which includes Washington, Oregon, California, Alaska and Hawaii. The surveyed individuals consumed an average of 0.39 kg/year of freshwater finfish over the year. Of those, 14.1 percent (300 individuals) were "consumers" of these fish. Considering the total population surveyed, it appears that 835 kg of freshwater finfish were consumed ($2,141 \text{ persons} \times 0.39 \text{ kg/person-year} = 835 \text{ kg/year}$). If this total amount of fish consumed is divided equally among the 300 individuals who actually consumed the fish, the result is an average of 2.8 kg of fish per consumer per year. On an annualized daily basis, this equates to an average of 7.6 g/day for each consumer. Similarly, the average rate of shellfish consumption by those 2,141 persons was 1.48 kg/year, for a total of 3,169 kg/year. Of the individuals surveyed, 49.2 percent were consumers. Dividing the total amount of shellfish consumed by the number of actual consumers results in an average daily fish consumption rate of 3.0 kg/year or 8.2 g/day. Combining the average finfish and shellfish consumption rates results in a combined consumption rate of 15.8 g/day. Because of the length of the recall period (1-month), these estimates can be considered more reliable than rates based on the USDA data. In addition, this estimate is more relevant to one of the populations of interest in Oregon (i.e., freshwater fish consumers within the general population of the state). These results indicate that the 17.5 g/day estimate proposed by DEQ is a reasonable surrogate.

EPA's (2000) methodology for the development of AWQC recommends that, when available, consumption rates for populations of concern should be drawn from local or regional survey data. Given that sport anglers are one group of fish consumers that are most likely to consume a large portion of their fish from a single watershed, it is appropriate to select a fish consumption rate that is protective of this subpopulation.

EPA's (1998a) Technical Support Document for AWQC derivation provides a summary of fish intake rates by sport anglers from different regions of the country. Among those there were two studies of Columbia River anglers in Washington State. Average consumption rates for these two studies ranged from 1.8 to 7.7 g/day.

After its review of the available sport-caught fish consumption data, EPA (1997) recommended fish consumption rates for freshwater recreational anglers. The average consumption rates recommended 5 g/day, based on both the Ebert et al. (1992) and Connelly et al. (1996) studies, 12 g/day (West et al., 1989) and 17 g/day (West et al., 1993). The upper percentiles recommended were 13 g/day (a 95th percentile based on a one-year recall survey by Ebert et al. 1993), 18 g/day (a 95th percentile based on a one year recall survey by Connelly et al., 1996) and 39 g/day (a 96th percentile based on a one-week survey conducted by West et al., 1989, which was extrapolated to long-term consumption using general questions about consumption during the remainder of the year). No upper percentile value was reported for the West et al. (1993) study because EPA (1997) recognized that the upper percentile value was unreliable and likely overstated due to the short length of the recall period, as discussed previously. It is likely that the rates reported by Ebert et al. (1993) and Connelly et al. (1996) are more reliable estimates of long-term consumption as they are based on long-term data. In addition, the West

et al. (1989) estimate included fish from commercial as well as recreational sources. According to West et al. (1989), 39 percent of the fish consumed by Michigan anglers were sport-caught fish. If one applies this percentage to the mean and 96th percentile of the West et al. study, the results are 5 g/day and 15 g/day, respectively, for consumption of sport-caught fish only. These results are very consistent with the rates reported for recreationally-caught fish by Ebert et al. (1993) and Connelly et al. (1996) and also support DEQ's proposed conservative default value of 17.5 g/day..

Use of the 17.5 g/day Consumption Rate, Along with Other Conservative Assumptions, Results in Highly Protective AWQC

AWQC are used as environmental benchmarks and as objectives in the development of environmental permits. While they are applicable to all ambient waters in Oregon, they are most often considered for individual water bodies when Oregon DEQ is developing permitting and effluent limits. Thus assumptions that are already judged and selected to be conservative when one is attempting to develop statewide criteria, become extremely conservative when considering individual water bodies.

In light of the way in which AWQC are applied in permitting, the approach used to develop AWQC includes a number of highly conservative assumptions, particularly for constituents that are limited and localized. The conservative assumptions used in the development of AWQC in Oregon include:

- o The fish consumption rates include the combined consumption of freshwater and estuarine fish and shellfish;
- o 100 percent of the fish consumed are assumed to be from a single water body;
- o Fish are consumed by individuals every year for 70 years;
- o No loss of compounds occurs due to cooking or preparation methods;
- o Concentrations of compounds in fish are in equilibrium with compound concentrations in the water body; and,
- o The allowable risk level is one in one million (10^{-6}).

Inclusion of Freshwater and Estuarine Fish and Shellfish

In developing AWQC, the fish consumption rates that are used include the ingestion of freshwater and estuarine finfish and shellfish. This is because AWQC need to be applied to a number of different types of water bodies throughout the state. However, this assumption is very conservative when one considers permitting of individual discharges that occur in specific areas of individual water bodies and usually affect either freshwater or estuarine areas, not both. If there is a permitted discharge to a freshwater body, the consumption of estuarine fish and shellfish is likely to be irrelevant. Similarly, if there is a discharge to an estuarine area, the freshwater fish upstream will likely not be affected. Thus, inclusion of rates of consumption of freshwater and estuarine finfish and shellfish is a very conservative assumption for these specific applications.

As discussed previously, the Rupp et al. (1980) analysis of fish consumption in the Pacific region indicated that the average rate of shellfish consumption by consumers was 8.2 g/day and the average rate of freshwater fish consumption by consumers was 7.6 g/day. Thus, when considering the application of AWQC to freshwater bodies, where shellfish are not likely to be

consumed, consumption will be overestimated by more than a factor of two when a combined consumption rate is used.

Assumption that 100 Percent of Fish Are From a Single Water Body

When the AWQC are applied for permitting, it is implicitly assumed that all fish are consumed from a single water body. This is a very conservative assumption for most of the water bodies that receive discharges.

In all of the key studies of recreational anglers discussed by EPA (1997), the consumption rates represented the total amount of sport-caught fish consumed by the survey respondents. The fish were obtained from a number of fisheries and thus generally overestimated consumption from single water bodies. The approach used to develop the AWQC assumes that the vast majority of the population consumes all of their fish from a single source. This is not likely to be the case for most water bodies.

Assumption of Equilibrium

The AWQC approach uses a factor for bioaccumulation. That factor assumes that the concentrations of constituents in fish are in equilibrium with constituent concentrations in the water body of interest. This is not likely to be the case for the most popular fish species harvested. According to the CRITFC (1994), the species of fish consumed most often by Columbia River tribal members were anadromous species (salmon, trout, lamprey and smelt), with the average rate of consumption for anadromous species nearly three times higher than the rates of consumption of resident species. Most anadromous species spend only a small fraction of their lifetime in the Columbia River. For example, after hatching, juvenile Chinook salmon spend several months in the river before they begin their out-migration to marine feeding areas. They generally return to the river to spawn between the ages of two and six years (ODFW, 1989) and do not generally feed during their spawning run. Thus these fish, which provide a substantial portion of the freshwater fish harvested both commercially and recreationally from the river, are clearly not at equilibrium with their surroundings. These migratory fish can spend much of their time in portions of the river not affected by discharges and only "pass through" river reaches that have discharges and associated higher concentrations of regulated compounds. Because of this exposure to varying concentrations of regulated compounds, migrating fish likely do not spend adequate time in a particular reach to achieve equilibrium with concentrations in the water column and, hence, have lower concentrations of a regulated compound than assumed by the AWQC. Thus, the AWQC likely overestimates the resulting tissue concentrations in such fish.

Duration of Consumption

The AWQC calculation assumes that individuals consume fish from a single source every year of their lives for 70 years. This assumption is highly conservative. Individuals are likely to move many times during their lifetimes and, as a result of those moves, may change their fishing locations and thus the sources of the fish they consume. In addition, it is likely that most anglers will not fish every year of their lives. Health issues and other demands, like work and family obligations, will likely result in no fishing activities or reduced fishing activities during certain periods of time that they live in a given area. Thus, to assume that an individual

consumes all fish from a single water body, every year throughout his/her lifetime is certainly a conservative and protective assumption that adds an additional level of protection to the AWQC.

Cooking and Preparation Loss

The AWQC does not account for the fact that levels of many contaminants, especially the lipophilic constituents like PCBs and dioxins and furans, are substantially reduced when individuals prepare and cook their fish. Thus for these constituents, the assumption that there is no loss due to cooking and preparation provides an additional level of protection to the AWQC.

Risk Level

In the EPA (2000, p. 2-6) methodology document, it is clear that the States and Tribes have the discretion to establish risk levels and to consider subpopulations of interest and concern. It states that "EPA believes that both 10^{-6} and 10^{-5} may be acceptable for the general population and that highly exposed populations should not exceed a 10^{-4} risk level." It goes on to say that "if the State or Tribe determines that a highly exposed population is at greater risk and would not be adequately protected by criteria based on the general population and by the national 304(a) criteria in particular, EPA recommends that the State or Tribe adopt more stringent criteria using alternative exposure assumptions" (EPA, 2000; p. 2-2). Furthermore, it states that "[I]n cases where fish consumption among highly exposed population groups is of a magnitude that a 10^{-4} risk level would be exceeded, a more protective risk level should be chosen." (EPA, 2000; p. 2-6)

Oregon DEQ is planning to use a one in a 10^{-6} risk level as the basis for the AWQC. This is at the conservative end of EPA's (2000) recommended risk range of 10^{-5} to 10^{-6} for the general population. Also discussed in the methodology document is the fact that subpopulations of concern should not be at a risk greater than 10^{-4} . If a 10^{-4} risk level is used to evaluate potential sensitive subpopulations, then these individuals could consume 100 times more fish than the general population of the state (which is being evaluated using a 10^{-6} risk level) and still be within acceptable exposure levels.

Oregon DEQ has proposed the use of a consumption rate of 17.5 g/day to protect the general population of Oregon and its recreational anglers. Higher-level consumers could consume 100 times that amount, or 1,750 g/day every day and still not exceed the benchmark level of 10^{-4} established by EPA (2000) for high consuming subpopulations.

According to data collected by the Columbia River Intertribal Fish Commission (CRITFC, 1994), the average rate of consumption for the Columbia River tribes was 58.7 g/day and the 95th percentile consumption rate was 170 g/day (EPA, 1997). This is well below the allowable consumption rate of 1,750 g/day associated with the 10^{-4} risk level, as discussed above, and is also below the consumption rate associated with the 10^{-5} risk level. Even if the maximum value reported from the CRITFC (1994) survey, 972 g/day, is considered, risks will still be well below the benchmark of 10^{-4} that has been recommended by EPA (2000) for highly exposed subpopulations.

The CRITFC (1994) data are consistent with other data for subsistence populations. In Table 2.3.9 of its *Ambient Water Quality Criteria Derivation Methodology Human Health Technical Support Document* (EPA, 1998a), EPA summarizes seven studies of subsistence

populations (Kmiecik, 1994; CRITFC, 1994; Degner et al., 1994; Hovinga, 1992-1993; EPA, 1992; Peterson et al., 1995; and Nobmann et al., 1992). While EPA (1998a) reported that the mean fish intake rates reported for those studies ranged from 23 to 351 g/day, the highest value, which was reported by Kmiecik (1994), was based on a personal communication, not a published or peer-reviewed study. Thus the methodology behind it and its reliability as an estimate of consumption cannot be established. (It should be noted that when EPA reviewed subsistence studies for its 1997 *Exposure Factors Handbook*, this study was not included.) If one eliminates the mean consumption rate presented by Kmiecik (1994), the range of mean intake rates from the six remaining studies is 23 to 109 g/day, with an average of 56 g/day. This is very similar to the average rate of 58.7 g/day reported by CRITFC (1994) for all tribal members surveyed.

This indicates that the use of a default fish consumption rate of 17.5 g/day, as is being proposed by Oregon DEQ, is also protective of the Columbia River tribes. The 95th percentile consumption rate reported by CRITFC for that population is approximately associated with a risk level of 10^{-5} and thus falls at about the mid-point of the EPA's acceptable risk range. Based on EPA's (1998a) evaluation of other studies of subsistence populations, this consumption rate also appears to be protective of any other potential subsistence populations that may be consuming fish from Oregon waters.

Summary and Recommendation

Oregon DEQ is proposing to revise its AWQC using a fish consumption rate of 17.5 g/day, based on USDA short-term dietary data. While a high level of uncertainty is associated with these data, the selected consumption rate appears to be a reasonable and conservative default when compared with other relevant consumption data.

Use of this consumption rate for the general and recreational population is very conservative when the AWQC is applied to the permitting of discharge limits. The AWQC approach is based on a 10^{-6} risk level, which is very protective of the entire state of Oregon and is likely to be overly protective of the much smaller populations that obtain fish from individual water bodies. In addition, the approach assumes that all freshwater finfish and shellfish consumed throughout a lifetime are obtained from a single water body and that there is no reduction of contaminant levels due to cooking and preparation methods. There are a very small number of individuals, if any, to whom such conservative assumptions would apply.

EPA (2000) has based its national AWQC on a 10^{-6} risk level. It also supports use of a 10^{-5} risk level when States or Tribes are establishing AWQC. EPA (2000) "also believes that criteria based on a 10^{-5} risk level are acceptable for the general population as long as States and Authorized Tribes ensure that the risk to more highly exposed subgroups (sport or subsistence anglers) does not exceed the 10^{-4} level." (EPA 2000; p. 1-12) Thus, the critical issue to consider is whether the use of a consumption rate of 17.5 g/day for the general population of Oregon is also protective for subpopulations of high consumers.

Based on EPA's recommended risk range and available fish consumption data, this consumption rate is also protective of recreational anglers and the Columbia River tribes. The proposed rate of 17.5 g/day (at a 10^{-6} risk level) can be increased by 100 times, to a rate of 1,750 g/day and still be within EPA's acceptable risk limit of 10^{-4} . Local and regional fish consumption data indicate that this consumption rate is substantially higher than even the

maximum fish consumption rate reported for the Native American population (CRITFC, 1994) and is also higher than the rates reported for other fish consuming subpopulations. Thus, an AWQC based on a consumption rate of 17.5 g/day is protective of the general population, recreational anglers, and the Native American population within the state, and falls well within EPA's guidelines for acceptable risk levels.

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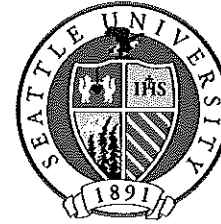
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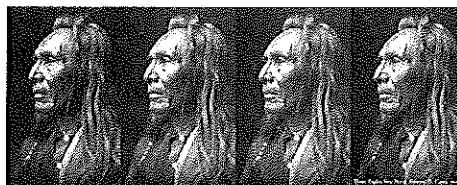
Comments of the Center for Indian Law and Policy

Please accept these comments on the Department of Ecology's draft *Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington* (September 2011)(hereinafter "draft TSD"), submitted on behalf of the Center for Indian Law and Policy, Seattle University School of Law. The Center for Indian Law and Policy was established in 2009. Under the Center are the classes, projects, programs and activities that focus on Indian law at Seattle University School of Law. The mission of the Center, beyond emphasizing learning opportunities for law school students, includes assisting Indian tribes and individuals to deal with the variety of unique laws that apply to them and making information about current legal issues available to Indian tribes and people. The Center does not represent any tribe in this process. Indeed, the Center wishes to underscore the importance of working directly with the individual tribes affected, within the context of a government-to-government relationship, as committed to under the terms of the *Centennial Accord between the Federally Recognized Indian Tribes in Washington State and the State of Washington*.¹ Rather, the Center offers these comments in the hope that they will be of value to Ecology as it refines its draft TSD.

I. Tribes' Unique Political and Legal Status and Rights to Fish

Tribes comprise distinct *peoples* with inherent rights. Tribes' status as self-governing, sovereign entities pre-dated contact with European settlers. This status, nonetheless, was affirmed by the nascent United States. Among other things, the United States viewed the Indian tribes as

¹ WASHINGTON GOVERNOR'S OFFICE OF INDIAN AFFAIRS, CENTENNIAL ACCORD BETWEEN THE FEDERALLY RECOGNIZED INDIAN TRIBES IN WASHINGTON STATE AND THE STATE OF WASHINGTON (1989), *available at* <http://www.goia.wa.gov/Government-to-Government/Data/CentennialAccord.htm>.



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nations, capable of entering into treaties.² Today, tribes are recognized to have a unique political and legal status – a status that sets them apart from every other “subpopulation” or group that might warrant particular consideration in a risk assessment or in decisions about environmental standards more broadly.³ Tribes’ rights and interests, moreover, are protected by a constellation of laws and commitments that are unique among groups affected by Ecology’s decisions. These include protections secured by treaties, laws, and executive orders that speak to the rights of tribes and their members.

The Treaty-Secured Fishing Rights

The starting place for an analysis of tribal fishing rights is a recognition that, prior to European contact, fishing, hunting, and gathering were vital to the lives of Indian people. Indians’ aboriginal title to this land included the right to engage in these practices.⁴ When tribes entered into treaties and agreements ceding lands to the United States, they often nonetheless reserved a suite of important rights, including their aboriginal fishing rights.⁵ For its part, upon entering into treaties and agreements with the various tribes of the Pacific Northwest, the United States bound itself and its successors to protect the tribes’ right to take fish in perpetuity.⁶ The Treaty of Point Elliott, for example, provides that “[t]he right of taking fish at usual and accustomed grounds and stations is further secured to said Indians in common with all citizens of the Territory”⁷ Although the precise language of the fishing clauses varies somewhat in the different treaties, U.S. courts have interpreted these provisions to secure to the tribes a permanent, enforceable right to take fish throughout their fishing areas for ceremonial, subsistence and commercial purposes.⁸ The treaties, moreover, have the status, under the Constitution, of “supreme law of the land.”⁹

² *Worcester v. Georgia*, 31 U.S. (6 Pet.) 515 (1832).

³ *See, e.g., U.S. v. Mazurie*, 419 U.S. 544, 557 (1977) (rejecting lower court’s characterization of tribe as mere association of U.S. citizens and finding, instead, that “Indian tribes are unique aggregations possessing attributes of sovereignty over both their members and their territory ...”); *see also Williams v. Lee*, 358 U.S. 217 (1959); *Morton v. Mancari* 417 U.S. 535 (1974).

⁴ FELIX COHEN, *HANDBOOK OF FEDERAL INDIAN LAW* 1120-24 (1982).

⁵ Tribes’ reserved fishing rights have been recognized, from the U.S. perspective, through various means, including treaties, agreements, and executive orders. *See, e.g., U.S. v. Anderson*, 6 Indian L. Rep. F-129 (E.D. Wash. 1979). These comments recognize the aboriginal origin of tribes’ fishing rights, and do not mean to exclude any of the various forms of recognition for these rights by use of the terms “rights,” “fishing rights,” and “treaty-secured” rights, unless the context suggests otherwise. Indeed, the rights themselves pre-exist the treaties or other agreements – these treaties and agreements “secure” or “guarantee” the pre-existing, aboriginal rights. Thus, these comments use the terms “treaty-secured” or “treaty-guaranteed” to emphasize this point.

⁶ The term “fish,” here and throughout, is understood to include all species of fish, including shellfish.

⁷ Treaty with the Duwamish, Jan. 22, 1855, U.S.-Duwamish, art. V, 12 Stat. 927 (1859).

⁸ *See, e.g., Confederated Tribes of the Umatilla Indian Reservation v. Alexander*, 440 F. Supp. 553 (D. Or. 1977) (finding that a proposed dam on Catherine Creek would infringe rights guaranteed to the Umatilla tribe by the Treaty with the Walla Walla and stating “[f]urther, while the 1855 treaty spoke only of ‘stations’, it is clear that the government and the Indians intended that all Northwest tribes should reserve the same fishing rights. ‘It is designed to make the same provision for all the tribes and for each Indian of every tribe. The people of one tribe are as much the people of the Great Father as the people of another tribe; the red men are as much his children as the white men.’” (quoting Governor Stevens)).

⁹ *Worcester v. Georgia*, 31 U.S. (6 Pet.) 515 (1832) (“The constitution [declares] treaties already made, as well as those to be made, the supreme law of the land . . .”).

Importantly, all of the rights not expressly relinquished by the tribes were retained. This is a crucial tenet of federal Indian law. As affirmed by the U.S. Supreme Court, the treaties represent “not a grant of rights to the Indians, but a grant of rights *from* them – a reservation of those not granted.”¹⁰ The historical record, from both sides, is very clear on the point that protections for the tribes’ pre-existing fishing rights were crucial to obtaining tribes’ assent to enter into the treaties.

Governor Stevens and his associates were well aware of the ‘sense’ in which the Indians were likely to view assurances regarding their fishing rights. During negotiations, the vital importance of the fish to the Indians was repeatedly emphasized by both sides, and the Governor’s promises that the treaties would protect that source of food and commerce were crucial in obtaining the Indians’ assent. It is absolutely clear, as Governor Stevens himself said, that neither he nor the Indians intended that the latter ‘should be excluded from their ancient fisheries,’ and it is accordingly inconceivable that either party deliberately agreed to authorize future settlers to crowd the Indians out of any meaningful use of their accustomed places to fish.¹¹

Accordingly, for more than a century, the courts have regularly interpreted the fishing right to encompass the subsidiary rights necessary to render it of continued relevance for tribal fishers. Among the facets of the treaty guarantees affirmed by the courts relevant to Ecology’s draft TSD are the points that: (1) “The treaty clauses regarding off-reservation fishing . . . secured to the Indians rights, privileges and immunities distinct from those of other citizens.”¹² (2) The rights secured to tribes by treaty are permanent, such that “[t]he passage of time and the changed conditions affecting the water courses and the fishery resources in the case area have not eroded and cannot erode the right secured by the treaties . . .”¹³ (3) “[N]either the treaty Indians nor the state . . . may permit the subject matter of these treaties [i.e. the fisheries] to be destroyed.”¹⁴ (4) The treaty fishing rights encompass the right to fish in all areas traditionally available to the tribes, and “[a]gencies] . . . do not have the ability to qualify or limit the Tribes’ geographical treaty fishing right (or to allow this to occur . . .) by eliminating a portion of an Indian fishing ground . . .,” except as necessary to conserve a species.¹⁵ (5) The treaty fishing rights encompass all available species of fish found in the treating tribes’ fishing areas. As the court explained in a subproceeding of *United States v. Washington* addressing shellfish, “[b]ecause the ‘right of taking fish’ must be read as a reservation of the Indians’ pre-existing rights, and because the right to take *any* species, without limit, pre-existed the Stevens Treaties, the Court must read the ‘right of taking fish’ without any species limitation.”¹⁶ These features of tribes’ rights are important in part because they continue to inform tribes’ aspirations for and entitlements to a future in which the exercise of their rights is robust, and tribal members’ consumption and use of the resources on which they have historically depended is restored.

¹⁰ *United States v. Winans*, 198 U.S. 371, 381 (1905)(emphasis added).

¹¹ *Washington v. Washington State Commercial Passenger Fishing Vessel Ass’n*, 443 U.S. 658, 676 (1979).

¹² *U.S. v. Washington*, 384 F. Supp. 312, 401 (W.D. Wash. 1974).

¹³ *Id.*

¹⁴ *U.S. v. Washington*, 520 F.2d 676, 685 (9th Cir. 1975).

¹⁵ See, e.g., *Muckleshoot v. Hall*, 698 F. Supp. 1504, 1513-14 (W.D. Wash. 1988)(enjoining construction of a marina in Elliott Bay that would have eliminated a portion of the tribes’ usual and accustomed fishing areas); see also *United States v. Oregon*, 718 F.2d 299, 305 (9th Cir. 1983) (holding that “the court must accord primacy to the geographical aspect of the treaty rights”).

¹⁶ 873 F. Supp. 1422, 1430 (W.D. Wash. 1994)(emphasis in original).

The “Culverts” Case

The U.S. courts’ most recent affirmation of the treaty guarantees is of a piece with these previous cases. In what is known colloquially as the “culverts” case,¹⁷ the court addressed a threat to the tribes’ treaty rights posed by environmental degradation. The culverts case is an outgrowth of *United States v. Washington*, in which Judge Boldt divided the questions before the court into two “phases.” In Phase II, the district court considered “whether the right of taking fish incorporates the right to have treaty fish protected from environmental degradation.”¹⁸ The court found that “implicitly incorporated in the treaties’ fishing clause is the right to have the fishery habitat protected from man-made despoliation....The most fundamental prerequisite to exercising the right to fish is the existence of fish to be taken.”¹⁹ On appeal, the district court’s opinion was vacated on jurisprudential grounds. The Ninth Circuit found its “general admonition” inappropriate as a matter of “judicial discretion” and stated that the duties under the treaties in this respect “will depend for their definition and articulation upon concrete facts which underlie a dispute in a particular case.”²⁰ So, in the culverts case, the tribes brought to the court’s attention such a set of concrete facts. Specifically, the tribes cited evidence that the state of Washington had improperly maintained culverts around the state, with the result that miles of salmon habitat were blocked, contributing to a decline in salmon numbers and thus an erosion of tribes’ ability to exercise their treaty-guaranteed right to take fish. Thus, the district court in the culverts case considered the question “whether the Tribes’ treaty-based right of taking fish imposes upon the State a duty to refrain from diminishing fish runs by constructing or maintaining culverts that block fish passage.”²¹

The court ruled in favor of the tribes’ request for a declaratory judgment to this effect. In finding that the state indeed had the duty urged by the tribes, Judge Martinez again considered carefully the intent of the parties to the treaties. He quoted at length from expert testimony that focused explicitly on the role of the fish as food, forever – testimony that emphasized that among the points of “taking” fish was, ultimately and obviously, eating fish.

Stevens specifically assured the Indians that they would have access to their normal food supplies now and in the future....

[T]he representatives of the Tribes were personally assured during the negotiations that they could safely give up vast quantities of land and yet be certain that their right to take fish was secure. These assurances would only be meaningful if they carried the implied promise that neither the negotiators nor their successors would take actions that would significantly degrade the resource.²²

Although the tribes brought their claim to the court in the context of a discrete set of facts – and Judge Martinez decided the question in this particularized context, thus avoiding a broad,

¹⁷ Order on Cross-Motions for Summary Judgment, *United States v. Washington*, No. 9213RSM, slip op. (W.D. Wash. 2007)(Subproceeding 01-1, docket number 392).

¹⁸ *United States v. Washington*, 506 F. Supp. 187, 190 (W.D. Wash. 1980)(Phase II) *vacated by* *United States v. Washington* 759 F.2d 1353 (9th Cir. 1985).

¹⁹ 506 F. Supp. at 203.

²⁰ 759 F.2d at 1357.

²¹ Subproceeding 01-1, slip op. at 5.

²² Subproceeding 01-1, slip op. at 11.

acontextual pronouncement – the “culverts” decision sends an unmistakable signal.²³ As successors to the negotiators, federal and state governments may be held to account for the actions they take – or permit others to take – that significantly degrade the treaty resource. Given the court’s concern with the *function* of the treaty resource, moreover – its role in securing food and livelihood for the tribes – governments may be held to account for actions that compromise the treaty resource whether by depletion or by contamination.

The tribes’ treaty-protected rights encompass geographical areas and species that will be affected by environmental standards (e.g., cleanup standards, water quality standards) premised upon the analysis in the draft TSD. As such, the draft TSD’s abbreviated discussion of tribes’ treaty-secured rights is legally untenable. Particularly glaring is the omission of any mention of the U.S. District Court’s recent “culverts” decision and its discussion of treaty-guaranteed fish as a source of food in perpetuity, given the evident implications of the court’s holding and rationale for Ecology’s draft TSD and future regulatory decisions. The timing of the culverts decision is also worth noting, inasmuch as pre-culverts understandings of the contours of the treaty-guaranteed rights must be read in light of their vintage. For example, to the extent that the TSD references state policies and standards crafted prior to the August 2007 culverts decision, these may reflect a crabbed view of the state’s treaty-based obligations that is no longer supportable.

Other Sources of Rights Unique to Tribes and Their Members

When the rights of tribes and their members are affected, as they are here, there is a particular constellation of laws and commitments that comes into play. This constellation is unique to tribes – it would not be relevant were only other groups’ interests affected, but it must be considered given that tribes’ rights are at stake. In addition to the treaties and agreements between the U.S. and the Pacific Northwest tribes discussed above, numerous state and federal legal commitments recognize the unique duties owed to tribes and their members. Among these are federal civil rights laws that prohibit recipients of federal funds (including state environmental agencies such as Ecology) from administering their programs in a way that discriminates against American Indians;²⁴ U.S. commitments under international law to protect the rights of indigenous peoples, including rights to traditional resources and to hunt, fish, and gather;²⁵ federal and state commitments to work with tribes on a government-to-government basis, in furtherance of tribal self-determination;²⁶ and federal and state commitments to further environmental justice, including specific mention of the need to protect subsistence fishing.²⁷

²³ Indeed, the court specifically repudiated the state of Washington’s argument that the Ninth Circuit, in vacating the district court’s opinion in Phase II, had rejected the existence of a treaty-based duty to avoid specific actions that impair the salmon fisheries by impairing their environment. Subproceeding 01-1, slip op. at 5-7.

²⁴ Civil Rights Act of 1964 sec. 106, 42 U.S.C. sec. 2000d (1988); 40 C.F.R. sec. 7 (1999).

²⁵ UNITED STATES MISSION TO THE UNITED NATIONS, ANNOUNCEMENT OF U.S. SUPPORT FOR THE UNITED NATIONS DECLARATION ON THE RIGHTS OF INDIGENOUS PEOPLES 6, 8 (2011) *available at* <http://usun.state.gov/documents/organization/153239.pdf> (recognizing that the Declaration calls upon the U.S. to acknowledge the “interests of indigenous peoples in traditional lands, territories, and natural resources,” and recognizing “that many indigenous peoples depend upon a healthy environment for subsistence fishing, hunting and gathering” and that various Declaration provisions address the consequent need for environmental protections).

²⁶ See, e.g., CENTENNIAL ACCORD, *supra* note 1.

²⁷ See, e.g., EXECUTIVE ORDER 12,898: FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS (Feb. 11, 1994) (singling out the issue of “subsistence consumption of fish and wildlife” in section 4-4, the only subject matter issue receiving specific mention in the Executive Order).

As governments, of course, the tribes manage and set environmental standards for the lands and waters over which they have authority. However, because tribes' rights, including treaty-secured rights, are impacted by environmental standards set by the state of Washington, Ecology must consider these rights when it issues standards and considers the technical and policy inputs to these standards.

II. Historical Fish Consumption Practices and Contemporary, "Suppressed" Rates

The tribes of the Pacific Northwest are fishing peoples. Historically, fish were vital to tribal life – a central feature of the seasonal rounds by which food was procured for ceremonial, subsistence, and commercial purposes. This fact is self-evident to tribal people. It has also been recognized by U.S. courts, which have observed that, at treaty times, "fish was the great staple of [Indians'] diet and livelihood,"²⁸ and thus fishing rights "were not much less necessary to the existence of the Indians than the atmosphere they breathed."²⁹

Historical Fish Consumption Practices and Rates

There are ample data documenting the role of fish as a dietary mainstay for Indian people prior to contact and at the time of the treaties. There were differences, of course, in the species relied upon and the quantities consumed, from group to group and from year to year. Nonetheless, there is no doubt that fish comprised a staple source of calories, protein, and other nutrients for tribal people throughout the Pacific Northwest. These data, moreover, drawn from multiple lines of scientific and social scientific evidence, have supported quantified estimates of historical consumption rates. For example, Deward Walker has estimated pre-dam fish consumption rates for the Columbia River tribes (Umatilla, Yakama, and Nez Perce), based on a review of the ethnohistorical and scientific literature. Walker has quantified total fish consumption for these peoples at 1000 grams/day.³⁰ Earlier estimates, for example, by Gordon Hewes, produced figures of similar magnitude. Hewes estimated salmon consumption rates for the Cayuse at 365 pounds/year (453.6 grams/day) and for the Umatilla and Walla Walla at 500 pounds/year (621.4 grams/day).³¹ Hewes' estimates for the Puget Sound tribes were similar. For example, he estimated salmon consumption rates for the Lummi and Nooksack tribes at 600 pounds/year (745.6 grams/day), for the Clallam at 365 pounds/year (453.6 grams/day) and for the Puyallup, Nisqually, and various other tribes at 350 pounds/year (435 grams/day).³² These and other data have been enlisted in peer-reviewed methodologies for quantitative exposure estimates for various Pacific Northwest tribes. For example, Barbara Harper, et al. concluded that "[h]istorically, the Spokane Tribe consumed roughly 1,000 to 1,500 grams of salmon and other fish per day."³³

²⁸ Fishing Vessel, 443 U.S. at 665 n.6 (citations and internal quotation marks omitted).

²⁹ United States v. Winans, 198 U.S. 371, 381 (1905).

³⁰ A. SCHOLTZ, ET AL., COMPILATION OF INFORMATION ON SALMON AND STEELHEAD TOTAL RUN SIZE, CATCH, AND HYDROPOWER- RELATED LOSSES IN THE UPPER COLUMBIA RIVER BASIN, ABOVE GRAND COULEE DAM, Fisheries Technical Report No. 2., Upper Columbia United Tribes Fisheries Center, Eastern Washington University (1985).

³¹ Gordon W. Hewes, *Indian Fisheries Productivity in Pre-Contact Times in the Pacific Salmon Area*, 7 NORTHWEST ANTHROPOLOGICAL RESEARCH NOTES 133, 136 (1973).

³² *Id.*

³³ Barbara L. Harper, et al., *The Spokane Tribe's Multipathway Subsistence Exposure Scenario and Screening Level RME*, 22 RISK ANALYSIS 513, 518 (2002). Harper, et al., improved upon the earlier estimates, among other things by accounting for the greater caloric requirements of an active, subsistence way of life. Thus, for example, while

The substantial degree to which fish were relied upon by the tribes at treaty time was emphasized in evidence before the court in *U.S. v. Washington*. Among the findings of fact in that case, Judge Boldt cited the following figure: “Salmon, however, both fresh and cured, was a staple in the food supply of these Indians. It was annually consumed by these Indians in the neighborhood of 500 pounds per capita [i.e., 621.4 grams/day].”³⁴

These historical, original, or “heritage” rates, moreover, have ongoing relevance for the fishing tribes, given that the treaty guarantees are in perpetuity and given that the tribes in fact seek to resume fish consumption practices and rates consonant with the treaty guarantees. Thus, for example, the Umatilla tribe looked to “original consumption rates along the Columbia River and its major tributaries” in developing a fish consumption rate for environmental regulatory purposes “because that is the rate that the Treaty of 1855 is designed to protect and which is upheld by caselaw. It also reflects tribal fish restoration goals and healthy lifestyle goals.”³⁵ In a similar vein, recent surveys of Swinomish tribal members showed that they sought to reinvigorate more robust fish consumption practices and to increase their fish intake.³⁶ The forward-looking nature of Ecology’s regulatory decisions to which the FCR proposed in the draft TSD is relevant (e.g., determinations of future uses of contaminated sites, restoration of waters to unimpaired, “fishable” status), makes the matter of tribes’ future aspirations vital.

Contemporary, “Suppressed” Fish Consumption Rates

In contrast to estimates of historical fish consumption rates, recent surveys of tribal populations produce estimates of contemporary fish consumption rates. It is important to recognize that these snapshots of contemporary practices will be distorted due to suppression.

“A ‘suppression effect’ occurs when a fish consumption rate (FCR) for a given population, group, or tribe reflects a current level of consumption that is artificially diminished from an appropriate baseline level of consumption for that population, group, or tribe. The more robust baseline level of consumption is suppressed, inasmuch as it does not get captured by the FCR.”³⁷

Note that suppression effects may infect attempts to assess consumption practices for various subpopulations or for the general population as well. For example, consumption surveys of women of childbearing age may reflect a current level of consumption that is diminished from levels that women in this group *would* consume, but for the existence of fish consumption

Hewes’ estimates assumed a 2000 kcal/day energy requirement, Harper, et al., used a 2500 kcal/day figure, “based on a moderately active outdoor lifestyle and renowned athletic prowess” of Spokane tribal members. *Id.* at 517.

³⁴ *U.S. v. Washington*, 384 F. Supp. at 380 (discussing Yakama consumption).

³⁵ STUART G. HARRIS & BARBARA L. HARPER, CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION, EXPOSURE SCENARIO FOR CTUIR TRADITIONAL SUBSISTENCE LIFEWAYS app. 3 (2004).

³⁶ JAMIE DONATUTO, WHEN SEAFOOD FEEDS THE SPIRIT YET POISONS THE BODY: DEVELOPING HEALTH INDICATORS FOR RISK ASSESSMENT IN A NATIVE AMERICAN FISHING COMMUNITY, 85-89 (Ph.D. dissertation, University of British Columbia 2008)(summarizing survey of Swinomish Indian Tribal Community members, finding multiple causes of suppressed consumption, and finding that 73% of respondents stated that they would like to eat more fish than they do now).

³⁷ NATIONAL ENVIRONMENTAL JUSTICE ADVISORY COUNCIL, FISH CONSUMPTION AND ENVIRONMENTAL JUSTICE, 43-45 (2002)

advisories due to mercury contamination.³⁸ However, when tribes are affected, there are two important differences. First, the “appropriate baseline level of consumption” is clear for tribes, whereas it may be subject to debate for other groups. Only tribes have legally protected rights to a certain historical, original, or heritage baseline level of consumption. Second, the causes of suppression have exerted pressure on tribes for a longer period, and in more numerous ways, than on the general population. Whereas those in the general population may have begun to reduce their intake of fish in response to consumption advisories once these became more prevalent in the 1970s and thereafter, tribal members have been excluded from their fisheries, and harassed and imprisoned for exercising their fishing rights, from shortly after the ink on the treaties dried. Indeed, the forces of suppression, often perpetrated or permitted by federal and state governments, have included inundation of fishing places; depletion and contamination of the fishery resource; and years of prosecution, intimidation, and gear confiscation.

As a consequence, contemporary surveys of tribal populations produce fish consumption rates that are artificially low compared to the appropriate, treaty-guaranteed baseline. The bias introduced by suppression effects, together with tribes’ treaty-secured right to catch and consume fish at more robust historical rates, means that it is inaccurate to refer to contemporary figures as “tribal fish consumption rates.” Indeed, the snapshot of contemporary consumption practices provided by recent surveys arguably represents a nadir – a low point from which tribes are working to recover as environments are restored and traditional practices reinvigorated.

Rather, contemporary surveys of tribal populations are properly viewed alongside other surveys used to document fish consumption by the general population and relied upon by government agencies in the environmental regulatory context. These studies are generally conducted in accordance with the conventions of western science, and have been found to be technically defensible by federal and state governments. These studies of tribal populations have been conducted under governmental or inter-governmental auspices, and subjected to internal and external peer review. As such, these studies follow the practice of studies of the national population that have been relied upon by EPA to set its default fish consumption rate for the general population.³⁹ The particular studies cited by Ecology’s draft TSD (surveys of the Tulalip and Squaxin Island tribes; the Suquamish tribe; and the Columbia River tribes) have explicitly been found technically defensible by the EPA and the state of Oregon and are relied upon by these governments for regulatory fish consumption rates; these studies have also implicitly been deemed technically defensible by other states and tribes that have adopted the EPA’s default subsistence consumption rates.⁴⁰

In fact, to the extent that contemporary surveys of tribal populations have erred on the side of following western scientific conventions, they tend to underestimate even contemporary tribal

³⁸ Emily Oken, et al., *Decline in Fish Consumption Among Pregnant Women After a National Mercury Advisory*, 102 OBSTET GYNECOL 346 (2003) (finding that pregnant women with access to obstetric care decreased fish consumption in response to publication of federal advisory warning of mercury contamination in certain species of fish).

³⁹ See U.S. ENVIRONMENTAL PROTECTION AGENCY, *METHODOLOGY FOR DERIVING AMBIENT WATER QUALITY CRITERIA FOR THE PROTECTION OF HUMAN HEALTH* (2000).

⁴⁰ *Id.*; OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, *OREGON FISH AND SHELLFISH CONSUMPTION RATE PROJECT* (2008).

consumption rates.⁴¹ Thus, for example, the study of the Tulalip and Squaxin Island tribes and the study of the Columbia River tribes both hewed to the statistical convention that “outliers” – in this case, representing high-end fish consumption rates – are treated as likely the source of error (for example, in recording a respondent’s fish consumption rate) rather than a true value. As such, it is common practice for such outlier data points to be omitted from the dataset that then forms the basis of population values (e.g., the mean, the 90th percentile) or to be “recoded” to coincide with a number closer to the bulk of the population, such as a number equal to three standard deviations from the mean. But, as has been recognized, some tribal members – particularly those from traditional and fishing families – in fact consume very large quantities of fish, even in contemporary times. Tribal researchers at Umatilla, for example, identified a subset of interviewees (35 of 75) who are “traditional fishers” and who confirmed eating fish “two to three times a day in various forms.”⁴² The average consumption rate for this group was found to be 540 g/day. Notably, the relatively high fish consumption rates indicated by this subset of tribal members reflect *actual* contemporary consumption, not – as assumed for so-called outliers – error. When outliers are treated according to statistical convention, the effect is to depress the various percentile values and, importantly, to fail to reflect the consumption practices of those tribal members whose practices today are most consonant with practices guaranteed to tribes by treaty and to which tribes, in an exercise of cultural self-determination, seek to return. A host of other conventions, detailed by tribal researchers, similarly operate so that, together, these surveys likely underestimate even contemporary tribal fish consumption rates.⁴³

In sum, the draft TSD cites studies of tribal populations that reflect surveys of contemporary, suppressed fish consumption consistent with the methods and approaches used by EPA, Oregon and other governments for setting regulatory standards. These surveys, conducted in accordance with and technically defensible by western scientific standards likely underestimate even contemporary, suppressed tribal consumption rates. The resulting fish consumption rates, of course, are not equivalent to treaty-guaranteed practices and rates; indeed, they grossly understate the rates at which tribes are entitled to consume fish.

III. Salmon

Salmon are vital to the health of tribal people in the Pacific Northwest, just as tribal people are vital to the survival of the salmon: the two are inextricably linked. The significance of the salmon is difficult to overstate. They are what might be termed “cultural keystone species,” at the center of physical, social, economic, spiritual, and political well-being for the tribes.⁴⁴ As one tribal member explains:

People need to understand that the salmon is part of who the Nez Perce people are. It is just like a hand is a part of your body....

⁴¹ See, e.g., Jamie Donatuto and Barbara L. Harper, *Issues in Evaluating Fish Consumption Rates for Native American Tribes*, 6 RISK ANALYSIS 1497 (2008).

⁴² Stuart G. Harris and Barbara L. Harper, *A Native American Exposure Scenario*, 17 RISK ANALYSIS 789 (1997).

⁴³ See, e.g., Donatuto and Harper, *supra* note 41.

⁴⁴ COAST SALISH GATHERING, SUMMARY OF CSG CLIMATE CHANGE SUMMIT (2010).

--Del White (Nez Perce)⁴⁵

Salmon Uptake Contaminants in Environments for which Washington has Regulatory Responsibility

Freshwater, estuarine, and marine environments are all necessary to the various salmon species and each of these environments is relevant to Ecology's regulatory responsibilities. The unique features of these various environments within Washington merit attention. Notably, the Puget Sound comprises a vast inland marine environment unlike any other in the continental United States. The Columbia River Basin and Estuary, too, is remarkable among river and estuarine systems. And, of course, the "waters of the State of Washington" also include portions of the marine environments of the Straits of Juan de Fuca and the open ocean and bays along the Pacific coast. Among other things, the unique and diverse characteristics of the environments affected by the draft TSD mean that care should be taken in considering descriptive terms such as "marine" encountered in both scientific and regulatory contexts. More generally, the uniqueness of these environments underscores the importance of Ecology's effort to consider locally relevant data, policies, and laws.

Salmon uptake contaminants in waters affected by Washington's environmental decisions. Different salmon species have different lifecycles. All species of salmon, however, live for some duration in Washington's freshwaters, estuaries, and inland and/or coastal marine waters. Some of these species dwell for considerable periods in these waters. Some chinook are resident here for their entire lives. And some species of salmon spend considerable time in the nearshore marine waters along Washington's coast.

Contaminants to the waters or sediments in these various environments may also move, that is, become dispersed, resuspended, or transported. Contaminants present in sediment reservoirs may be disturbed and redistributed through a host of mechanisms, including benthic species such as annelids, mollusks and crustaceans; storm events; and tidal influences. Models and empirical data demonstrate that sediment contaminants can be remobilized, resuspended to the water column, and then redeposited to distant areas. Additionally, given the unique geological and other features of the Puget Sound, contaminant resident times are extended relative to other estuaries, with greater opportunities for contaminant trapping and mixing as a consequence.

The result of these phenomena is that salmon come in contact with contaminants for which Washington has regulatory responsibility at various points in their lifecycle, if not throughout their entire lifecycle. These contaminants, studies have shown, bioaccumulate in salmon.⁴⁶ Ultimately, these contaminants – including mercury, PCBs, dioxins, and others – contribute to salmon body burdens that have adverse effects for the humans that consume salmon. Many of these contaminants also have adverse effects for the salmon themselves, as these toxins impair essential behaviors and threaten reproductive success.

Ecology's draft TSD correctly recognizes the diverse salmon lifecycles and survival strategies, as well as the occasions for contaminant dispersal, resuspension and transport, and appropriately

⁴⁵ DAN LANDEEN & ALLEN PINKHAM, SALMON AND HIS PEOPLE: FISH & FISHING IN NEZ PERCE CULTURE 156 (1999).

⁴⁶ See, e.g., U.S. ENVIRONMENTAL PROTECTION AGENCY, COLUMBIA RIVER BASIN FISH CONTAMINANT SURVEY (1996-98).

concludes that Ecology must reduce the resulting threats to the salmon and those (including humans) that depend on the salmon for food. The draft TSD's determination that salmon not be excluded from the default FCR reflects the most defensible interpretation of the data and consideration of the relevant scientific, policy, and legal context.

Indeed, Ecology's determination that salmon not be excluded rests on even more robust support than suggested by the draft TSD. Although the draft TSD correctly recognizes the complexities involved in connecting the source of environmental contaminants with their presence in salmon consumed by humans, it gives undue emphasis to dated and/or localized scientific data and to regulatory determinations based on this data.

The draft TSD relies heavily on a study of Puget Sound estuaries by Sandra O'Neill, et al. from 1998, quoting its observation that "chinook and coho salmon accumulate most of their PCB body burden in the marine waters of the Puget Sound and the ocean ..." and its further suggestion that the "contaminant body burden attributable to freshwater and estuarine environments was negligible compared with the residency time, growth patterns, and feeding habits of the salmon at sea." In doing so, the draft TSD may give the misimpression that all "marine waters of the Puget Sound" and at least some of the "marine waters of ocean" are irrelevant for Washington's default FCR – which is not the case given Ecology's responsibility for regulating the Puget Sound and substantial stretches of coastal marine waters. The draft TSD also neglects to cite more recent work by these same researchers published in 2009 that found PCB contamination in subadult and maturing chinook salmon collected from Puget Sound in concentrations "3–5 times higher than those measured in six other populations of Chinook salmon on the West Coast of North America," and that led these researchers to "hypothesize[] that residency in the contaminated Puget Sound environment was a major factor contributing to the higher and more variable PCB concentrations in these fish. This hypothesis was supported with an independent data set from a fishery assessment model, which estimated that 29% of subyearling Chinook salmon and 45% of yearling out-migrants from Puget Sound displayed resident behavior."⁴⁷ The draft TSD similarly could be strengthened by citing several more recent studies by other researchers buttressing the conclusion that outmigrant chinook uptake contaminants in the Lower Columbia River Basin and Estuary and in Puget Sound at levels of concern (for salmon survival and for human health). Thus, the TSD cites Johnson, et al.'s findings from 2007 respecting selected pesticides and persistent organic pollutants (POPs), but should also cite the recent work of Sloan, et al., from 2010 (PBDEs); and Yanagida, et al., from 2011 (PAHs).⁴⁸

⁴⁷ Sandra M. O'Neill & James E. West, *Marine Distribution, Life History Traits, and the Accumulation of Polychlorinated Biphenyls in Chinook Salmon from Puget Sound, Washington*, 138 TRANSACTIONS OF THE AMERICAN FISHERIES SOCIETY 616 (2009); see also James E. West, et al., *Spatial extent, magnitude, and patterns of persistent organochlorine pollutants in Pacific herring (Clupea pallasii) populations in the Puget Sound (USA) and Strait of Georgia (Canada)* 394 SCIENCE OF THE TOTAL ENVIRONMENT 369 (2008) (finding significantly higher concentrations of PCBs and DDT in herring – an important food source for salmon – from Puget Sound than in herring from the Strait of Georgia).

⁴⁸ Catherine A. Sloan, et al., *Polybrominated Diphenyl Ethers In Outmigrant Juvenile Chinook Salmon From The Lower Columbia River And Estuary And Puget Sound, WA*, 58 ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY 403 (2010); Gladys K. Yanagida, et al., *Polycyclic Aromatic Hydrocarbons and Risk to Threatened and Endangered Chinook Salmon in the Lower Columbia River Estuary*, __ ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY __ (2011) available at <http://www.ncbi.nlm.nih.gov/pubmed/21894559>.

In a related vein, although the draft TSD appropriately details the variation in salmon life cycles and behaviors, it prominently features earlier regulatory determinations premised upon the assumption that salmon migrate quickly through contaminated sites and feed heavily in the open ocean, where they obtain most of their chemical contaminants.⁴⁹ However, recent data have highlighted the importance of the nearshore marine environment, and have led scientists with the Pacific Estuary Research Society to debunk several “fallacies” about salmon behavior, including the notion that “[w]hen leaving natal streams, juvenile salmon enter Puget Sound, head north, and then out through the Strait of Juan de Fuca to the Pacific Ocean.”⁵⁰ Rather, research “clearly reveals that salmon use the Puget Sound basin widely, and migrate back and forth within it, heavily.”⁵¹ In fact, “[m]any authors reported finding extensive juvenile salmon use along the estuarine and nearshore landscape, as well as strong evidence from coded-wire tag data of cross-Sound migration. Fish from north Puget Sound areas are found in central and south Puget Sound studies, and vice versa.”⁵²

In turn, the draft TSD gives undue emphasis to regulatory determinations and regulatory guidance that were based on earlier scientific understandings of salmon life cycles and contaminant uptake. The 2007 EPA Region X/Department of Ecology Human Health Risk Assessment for the *Lower Duwamish Waterway Remedial Investigation*, for example, supported its exclusion of salmon from the FCR in its exposure assessment by stating that “bioaccumulative chemical concentrations in adult salmon are believed to be largely attributable to uptake during their migrations far beyond the [Lower Duwamish Waterway].”⁵³ The 2007 EPA Region X *Framework for Selecting and Using Tribal Fish and Shellfish Consumption Rates for Risk-Based Decision Making at CERCLA and RCRA Cleanup Sites in Puget Sound and the Strait of Georgia* presents the option of excluding salmon from exposure assessments and notes that this option “has been based on the assumption that adult salmon spend most of their lives in the open ocean and take up bioaccumulative and persistent contaminants almost exclusively via the food chain in that environment” and also on the “presum[ption] that site-related chemicals are not transported to that relatively distant aquatic environment, where adult salmon might be exposed to them through the food chain.”⁵⁴ The 2007 Region X *Framework* supports these assumptions by reference to the dated 1998 O’Neill, et al., study.

Regulatory Guidance and Precedent with Respect to Salmon

The most relevant regulatory precedent – that of the Oregon Department of Environmental Quality – included salmon in its FCR. This regulatory determination is not only the most recent, it is also the result of a comprehensive assessment by an independent panel of experts constituted

⁴⁹ See, e.g., Ecology draft TSD, at 17 (citing Lower Duwamish Waterway Remedial Investigation).

⁵⁰ PACIFIC ESTUARY RESEARCH SOCIETY, SALMON IN THE NEARSHORE: WHAT DO WE KNOW AND WHERE DO WE GO? 2 (2004).

⁵¹ *Id.*

⁵² *Id.* at 1.

⁵³ U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION X AND WASHINGTON DEPARTMENT OF ECOLOGY, LOWER DUWAMISH WATERWAY REMEDIAL INVESTIGATION, APP. B: BASELINE HUMAN HEALTH RISK ASSESSMENT 91 (2007).

⁵⁴ U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION X FRAMEWORK FOR SELECTING AND USING TRIBAL FISH AND SHELLFISH CONSUMPTION RATES FOR RISK-BASED DECISION MAKING AT CERCLA AND RCRA CLEANUP SITES IN PUGET SOUND AND THE STRAIT OF GEORGIA 10 (2007).

by ODEQ, i.e., the Human Health Focus Group. The ODEQ regulatory determination is relevant inasmuch as the fish consumption surveys on which the Human Health Focus Group based its conclusions are the same studies that inform Ecology's draft TSD – studies specifically focused on consumers and practices in Washington and on those affected by Washington's environmental standards. The ODEQ precedent, moreover, is the most clearly analogous to the regulatory context presented by Ecology's draft TSD, given that it applies broadly to freshwater, estuarine, and marine waters regulated by ODEQ – as is the case with the default FCR range proposed by Ecology. In fact, given that Oregon has no equivalent to the large inland marine environment of Washington's Puget Sound, Oregon's determination that salmon be included in its FCR is of even greater moment. If Oregon's comparatively small inland marine responsibilities supported the inclusion of salmon, then the more extensive inland marine environment for which Washington has regulatory responsibility makes an even stronger case for retaining salmon in the default FCR. And, both Washington and Oregon include their nearshore and coastal marine waters (to a distance extending three miles into the open ocean) in the waters for which they have regulatory responsibility.

Nor should EPA guidance be misconstrued as mandating that salmon be excluded.⁵⁵ Neither the 2007 EPA Region X *Framework* nor the 2000 EPA *Ambient Water Quality Criteria Methodology* supports this claim. First, as a preliminary matter, both of the documents are guidance documents; as such, they do not impose legally binding requirements. Second, the EPA Region X *Framework* does not require that salmon be excluded, even in the contexts for which it provides guidance (i.e., CERCLA and RCRA cleanups in Puget Sound); rather, it poses the question whether salmon should be included or excluded, and sets forth considerations for making this determination. And, as noted above, it poses this question based on assumptions about salmon residency and life cycles and about contaminant movement that may give undue emphasis to now-dated scientific understandings. Third, the EPA *AWQC Methodology*, which provides guidance to agencies setting water quality criteria under the federal Clean Water Act, sets forth a four-part hierarchy that directs states and tribes to prefer data representative of the local population and watersheds being addressed and to enlist national default FCRs only as a last resort.⁵⁶ The fact that EPA's national default values classify salmon as a "marine" species and exclude all marine species from the national default tally says nothing about whether state and tribal agencies should do so in considering their local circumstances. In fact, EPA's guidance *emphasizes precisely the opposite*, "strongly" urging these agencies to "protect highly exposed populations groups" affected by their decisions and to "use local or regional data over the default values." EPA's guidance thus directs Ecology to prefer local data and to account for local environmental conditions, including the fact that a significant portion of regulated waters in Washington are marine, and the fact that salmon spend time in and uptake contaminants in freshwater, estuarine, and marine environments. The EPA's recent approval of Oregon's standards, which, as noted above, rely on local data and decline to exclude salmon, underscores this point and suggests that an alternative interpretation of EPA's guidance is not correct.

Salmon and Tribal Members' Unique Consumption Practices

⁵⁵ This assertion was voiced at the public workshop on Ecology's draft TSD, held at the University of Washington, School of Public Health, Seattle, WA (December 12, 2011).

⁵⁶ U.S. ENVIRONMENTAL PROTECTION AGENCY, AMBIENT WATER QUALITY CRITERIA METHODOLOGY, *supra* note 39.

Pacific Northwest tribal members often consume a different mix of fish species and parts, and use different preparation methods than the general population. This is the case for salmon, as studies have demonstrated. Suquamish tribal members, for example, report consuming salmon with the skin on 26% of the time, and salmon eggs 18% of the time.⁵⁷ The National Environmental Justice Advisory Council recognized that these different practices often do not get accounted for in environmental standard-setting, and recommended that agencies do a better job of accounting for the resulting increased exposures to contaminants in fish.⁵⁸ Yet scientific studies measuring contaminant burden frequently measure fish muscle tissue (i.e. skin-off fillet) only,⁵⁹ which likely understates exposures to lipophilic contaminants. As well, agencies often assume that humans will not be exposed to lipophilic contaminants that have been “depleted” to salmon eggs. The draft TSD discusses the fact that the lipid redistribution that occurs as salmon reach reproductive maturity and ascend to their spawning grounds leads to the concentration of lipophilic contaminants in salmon roe. But the TSD does not connect this fact to human health impacts. Indeed, gram for gram, salmon roe would be expected to be a highly concentrated source of lipophilic contaminants. Thus, retaining rather than excluding salmon in the default FCR (including all parts of the salmon consumed by tribal people) is the appropriate, health protective response.

Moreover, tribal members’ consumption practices can only be understood in light of their cultural context. The tribes have reiterated this point in various public fora and documents (for example, the Suquamish fish consumption survey). The draft TSD also appropriately weighs the cultural significance of salmon to the tribes as it considers the totality of the circumstances relevant to its decision to include salmon consumption in its estimates of total fish consumption. Among other things, this particular solicitude for the cultural importance of salmon to the tribes is necessitated by Washington state’s commitment in the Centennial Accord, which states that “[t]he parties share in their relationship particular respect for the values and culture represented by tribal governments.”⁶⁰

In sum, the salmon, including all parts consumed by tribal people, are contaminated. The most recent data show that salmon get some or all of these contaminants from waters and sources for which Washington has regulatory responsibility. If Ecology were to omit salmon from its calculation of the FCR, it would be ignoring this undeniable source of exposure to all those who consume salmon. The relevant regulatory precedent and guidance, correctly interpreted, does not support artificially excluding salmon. In fact, it suggests the opposite. Moreover, given the centrality of salmon to tribal life, it is unacceptable to exclude salmon from the tally of fish that will be protected and kept fit for human consumption under our environmental standards.

IV. Risk, “Reasonableness,” and Rights

Although Ecology’s draft TSD focuses on a default fish consumption rate, it raises, explicitly or implicitly, several policy assumptions and value judgments that affect *who* is protected by

⁵⁷ THE SUQUAMISH TRIBE, FISH CONSUMPTION SURVEY OF THE SUQUAMISH INDIAN TRIBE OF THE PORT MADISON INDIAN RESERVATION 42 (2000).

⁵⁸ NEJAC, FISH CONSUMPTION REPORT, *supra* note 37.

⁵⁹ *See, e.g.,* O’Neill & West, *supra* note 47 (although a few measurements were taken of “whole body” samples, the bulk of the data on contaminant body burden were derived from “skin-off fillet” samples).

⁶⁰ CENTENNIAL ACCORD, *supra* note 1.

environmental standards. In the regulatory context, these protections are theoretically meant to apply to all. As environmental agencies have come to recognize, however, we are not “all” the same from a public health perspective. Agencies have recognized that, in order to protect public health, environmental standards would need to be set so as to protect even the most “vulnerable” members of the population (i.e., most exposed, most susceptible, or most sensitive due to the coincidence of lifestage and characteristics of particular contaminants, e.g., neurodevelopmental toxins such as mercury). In doing so, of course, those less vulnerable would *also* be protected. However, recognizing the multiplicative nature of quantitative exposure assessment, agencies sought to avoid setting standards that were protective of non-existent individuals – phantom composites of maximum assumptions for the various parameters in the exposure equation. EPA, for example, uses the concept of “reasonable maximum exposure” (RME) in its guidance under CERCLA to capture this focus on *actual* high-end exposures rather than phantom exposures beyond the high end of a distribution of all those exposed. A related device enlisted by environmental agencies targets regulatory standards at the 90th or 95th percentile of an exposure distribution for the relevant population. The result is to protect the bulk of the population – all but the most-exposed 10 or 5 percent.

The value judgments involved in such determinations and their implications for particular highly-exposed groups were often not made explicit, a point brought to the fore by the National Academy of Science’s important review of risk assessment in the regulatory context.⁶¹ Among other things, the plausibility of these value judgments may have stemmed from an early assumption – now recognized to be inaccurate – that the population to be protected was more or less homogenous for purposes of exposure assessment, i.e., that variability was small for the relevant parameters (e.g., FCR, exposure duration, etc.) in the exposure equation. Indeed, some discussions in this context assume that we are all equally likely to occupy the high end of an exposure distribution.⁶² On this assumption, of course, the regulatory choice to target protection at, say, the 50th versus the 90th percentile of an exposure distribution is effectively abstracted – a decision about identitiless, statistical lives. But tribes and other highly-exposed groups have documented the fact that it is they who occupy the high end of such exposure distributions – thus, we now know the identities of those whose fish consumption practices place them among the maximally exposed. Too, the plausibility of these value judgments may have found support in the general public’s lack of awareness of tribal fish consumption practices, particularly the relatively high fish consumption rates these produced. This disbelief was reflected, for example, in comments to earlier amendments to Washington’s MTCA regulation: “*Who in the world would expect their fish diet to come from the same contaminated source?*”⁶³ In short, we are now aware that we are not debating probabilities; there are *actual* people who consume fish at (and who would consume above, but for the forces of suppression) the very highest rates, and we know who they are. A regulatory determination to set the FCR, say, at the 80th percentile of contemporary consumption surveys (as is the case for the lower end of the range proposed by the draft TSD) or some lower number, is thus a choice to deny protection to the actual people consuming at rates above this value, virtually all of whom will be tribal people or members of Asian/Pacific Islander or other higher-consuming groups.

⁶¹ NATIONAL RESEARCH COUNCIL, SCIENCE AND JUDGMENT IN RISK ASSESSMENT (1994).

⁶² Catherine A. O’Neill, *Variable Justice: Environmental Standards, Contaminated Fish, and “Acceptable” Risk to Native Peoples*, 19 STANFORD ENVIRONMENTAL LAW JOURNAL 3, 74 (2000).

⁶³ WASHINGTON DEPARTMENT OF ECOLOGY, RESPONSIVENESS SUMMARY ON THE AMENDMENTS TO THE MODEL TOXIC CLEANUP CONTROL ACT CLEANUP REGULATION: CHAPTER 173-340 WAC, 218 (1991)(emphasis added).

Relatedly, it is not appropriate for Ecology to increase its default FCR but then redefine the level of risk it would find “acceptable,” thereby tolerating an order or two of magnitude greater risk for those most exposed. This end-run around the more protective environmental standards that would result from an increased FCR has been suggested in public comments.⁶⁴ Such an argument might be entertained, again, if we thought everyone were equally likely to be exposed to this greater risk. But here in Washington we know that this is not the case. We know precisely who it is that consumes greater quantities of fish. In this case, an argument for redefining the acceptable level of risk becomes unconscionable.

Moreover, when these policy determinations are made in a context affecting tribes’ treaty-secured rights, as is the case in Washington, the calculus must be different than were tribes’ rights and resources unaffected. That is to say, agencies may be free to “balance” the public health and other relevant considerations when making a policy determination whether to accommodate the very high-end exposures of a group such as soil pica children.⁶⁵ Agencies in such cases ought to undertake this balancing in a manner that is scientifically and morally defensible. But where those affected are tribes and their members, agencies are also governed by the particular laws and policies that are unique to this group. Agencies’ work here must also be legally defensible, viewed in light of the rights secured to tribes and their members by the Constitution, treaties, laws, and executive commitments to tribal self-determination and to environmental justice. Indeed, in the context of rights secured by treaty, as U.S. courts have held, agencies are not free to balance away these tribal rights.⁶⁶ As the court explained in *United States v. Michigan*, a case addressing treaty-secured fishing rights in the Great Lakes, tribes’ rights are “distinct from the rights and privileges held by non-Indians and may not be qualified by any action of the state ... except as authorized by Congress.”⁶⁷ Tribes’ treaty-secured rights are guaranteed to all tribal members, not some. Notably, when environmental standards are keyed to lower percentile values, or when “acceptable” risk levels are manipulated to tolerate greater risks for the most highly exposed, it is the most traditional subset of the tribal population – those families whose practices are most consonant with the practices guaranteed by treaty – that are left unprotected. The consequences for tribes who have been working to reinvigorate such traditional practices are plain.

Conclusion

Tribes’ rights, including treaty-secured rights, are impacted by environmental standards set by the state of Washington. Ecology must therefore consider these rights when it issues standards and considers the technical and policy inputs to these standards. As successors to the treaty negotiators, state governments such as Washington may be held to account for the actions they take – or permit others to take – that significantly degrade the treaty resource. This point has received emphasis by United States courts, particularly in the recent *Culverts* decision. Given

⁶⁴ See Stoel Rives, Comments on Washington Department of Ecology’s Water Quality Standards Triennial Review (Dec. 17, 2010) available at http://www.ecy.wa.gov/programs/wq/swqs/TriennialRevComm/Stoel_Rives_Loehr.pdf.

⁶⁵ This example was erroneously suggested as being analogous to agencies’ determination in the tribal context, when treaty and other tribal rights are in issue, at the public workshop on Ecology’s draft TSD, held at the University of Washington, School of Public Health, Seattle, WA (December 12, 2011).

⁶⁶ See, e.g., *Cappaert v. United States*, 426 U.S. 128, 138-39 (1979); *United States v. Michigan*, 471 F. Supp. 192, 281 (W.D. Mich. 1979).

⁶⁷ *United States v. Michigan*, 471 F. Supp. at 281.

courts' concern with the *function* of the treaty resource, moreover – its role in securing food and livelihood for the tribes – the state may be held to account for actions that compromise the treaty resource whether by depletion or by contamination.

Contemporary surveys of tribal populations produce fish consumption rates that are artificially low compared to the appropriate, treaty-guaranteed baseline. The bias introduced by suppression effects, together with tribes' treaty-secured right to catch and consume fish at more robust historical rates, means that it is inaccurate to refer to contemporary figures as “tribal fish consumption rates.” Historical, original, or “heritage” rates are also of ongoing relevance for the fishing tribes inasmuch as the tribes in fact seek to resume fish consumption practices and rates consonant with the treaty guarantees.

The fish consumption surveys cited by Ecology's draft TSD, conducted in accordance with and technically defensible by western scientific standards likely underestimate even contemporary, suppressed tribal consumption rates. The resulting fish consumption rates, of course, are not equivalent to treaty-guaranteed practices and rates; indeed, they grossly understate the rates at which tribes are entitled to consume fish.

Salmon are of utmost importance to the tribes. Salmon should not be artificially excluded from the estimates of total fish consumption for Washington's default FCR because to do so would undermine tribes' rights, including treaty-secured rights.

Salmon should be retained in the default FCR because the most recent science does not adequately support the exclusion of salmon. Ecology's draft TSD correctly recognizes the diverse salmon lifecycles and survival strategies, as well as the occasions for contaminant dispersal, resuspension and transport, and appropriately concludes that Ecology must reduce the resulting threats to the salmon and those (including humans) that depend on the salmon for food. The draft TSD's determination that salmon not be excluded from the default FCR reflects the most defensible interpretation of the data and consideration of the relevant scientific, policy, and legal context. Indeed, Ecology's determination that salmon not be excluded rests on even more robust support than suggested by the draft TSD.

Ecology's determination in its draft TSD to retain salmon in the default FCR is further strengthened by the fact that the most analogous recent regulatory precedent – that of Washington's sister state of Oregon – similarly retains salmon in its statewide fish consumption rate. EPA's approval of Oregon's standards lends further weight to the technical and legal appropriateness of including salmon in Washington's FCR.

Regarding the regulatory context for Ecology's consideration of the default FCR, we are now aware that we are not debating probabilities; there are *actual* people who consume fish at (and who would consume above, but for the forces of suppression) the very highest rates, and we know who they are. A regulatory determination to set the FCR, say, at the 80th percentile of contemporary consumption surveys (as is the case for the lower end of the range proposed by the draft TSD) or some lower number, is a choice to deny protection to the actual people consuming at rates above this value, virtually all of whom will be tribal people or members of Asian/Pacific Islander or other higher-consuming groups. Relatedly, if agencies manipulate “acceptable” risk levels so as to tolerate greater risks for the most highly exposed, protections for these groups will be short-circuited. Importantly, while agencies may be free to “balance” the public health and

other relevant considerations when making a policy determination whether to accommodate the very high-end exposures of a group such as soil pica children, agencies' work is different where tribes are among the most exposed: it is governed by a unique panoply of laws protecting tribes and their members. As a consequence, agencies cannot simply balance away these tribal rights.

For too long, polluting sources in Washington have gotten a free "pass" – at the expense of all Washingtonians who eat fish or who sell fish for a living. Ecology has a responsibility to protect these people and their livelihoods. Until Ecology adopts a new FCR and updates its environmental standards, it leaves people who eat Washington finfish and shellfish exposed to unacceptable levels of risk from PCBs, mercury, dioxins, and other toxic contaminants. Ecology must act to remedy this unacceptable situation, and uphold its obligations to tribal and non-tribal people alike.

Respectfully submitted,

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January 17, 2012

Ted Sturdevant, Director
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RE: Comments on Ecology's Fish Consumption Rate Technical Support Document

Thank you for the opportunity to comment on Department of Ecology's "Fish Consumption Rates Technical Support Document: A Review of Data and Information about Fish Consumption in Washington, September 8, 2011". The Confederated Tribes of the Colville Reservation (CCT) is very interested in the outcome of this document and would like to provide general and specific comments to the document which will ultimately impact and affect tribal resources and tribal fish consumption.

Current Washington State Consumption Rate

Given the national trend of increasing fish consumption, the adamant recommendation of the Washington Department of Health, and the fact that current consumption rates do not account for suppression factors, we support Ecology's findings and recommendations that recent available scientific information supports a substantially higher consumption default rate range of 157 to 267 grams per day. We recommend a rate at the higher end of the range because it will reflect a more protective level.

Tribal Consumption Rates and Tribal Information Support a Higher Consumption Rate

The CCT is a confederation of twelve tribes within a current reservation of 1.4 million acres and 1.5 million acres of ceded lands (former reservation) where we have Supreme Court affirmed hunting and fishing rights. Tribal ancestral lands are vast, encompassing millions of acres of lands within watersheds where tribes continue their connection to their families, cultural practices and food resources. Within the CCT regulatory infrastructure, we provide tribal codes to protect reservation natural resources including our own fish consumption rate, clean-up standards and natural resource management programs to support overall tribal goals and objectives.

The CCT vision and current management objectives include aggressive programs and projects to provide more fish to tribal people and to residents of the state who reside near the Columbia River and those watersheds that drain into the Columbia. Members of the CCT are the only Tribal people who are fishing salmon on the Columbia River (and tributaries) from their own reservation lands. In addition to the management of programs to recover endangered and

threatened fish populations, the CCT is providing fish to tribal subsistence users and non-tribal residents by providing for more fish through habitat improvements, hatchery development, fish distribution efforts, and programs on reservation and throughout our U&A areas.

The CCT are in a unique situation where we seek a dynamic balance between the importance/priority of anadromous species such as salmon versus habitat needs of resident fish. We are presently managing for partial losses of salmon due to the construction of the two largest dams on the Columbia system which are located partially on the Colville Reservation. Currently salmon migrating up the Columbia River do not pass the Chief Joseph Dam, but we fish for salmon at the tailrace of Chief Joseph Dam and as they run up the Okanogan River system. The CCT is currently constructing a salmon hatchery on the Columbia near the mouth of the Okanogan River to provide salmon for tribal subsistence use and to bolster salmon recovery in the system for the future. The hatchery will provide an added benefit to non-tribal fish consumers in the state.

Recent CCT data support a trend of increasing fish being harvested. Colville Tribal Fish and Wildlife Program reported 9,845 Sockeye and Chinook harvested from Okanogan and Columbia Rivers from 2002 through 2006, this number increased substantially in the past five years to 44,148 from 2007 through 2011.¹ Creel data from the Columbia River, Lake Rufus Woods reach (above Chief Joseph Dam to Grand Coulee Dam) reported 5,916 anglers with 5,714 fish count². This area is also being evaluated for potential salmon habitat/passage, and is currently being utilized by commercial aquaculture facilities. Those aquaculture facilities are currently raising millions of pounds of triploid rainbow trout annually. CCT has been purchasing fish from the commercial facility, which are released in the Columbia for tribal subsistence and recreational fish opportunities; from 1997 to 2005 over 200,000 fish were released under this program. This reach of the Columbia River has become an incredibly popular trophy and meat fishery with fishing visits exceeding 40,000 angler days per year (Shallenberger, 2008).

We are currently in the process of updating our CCT Water Quality Standards and revising our own fish consumption rate based on new available scientific data and a recent tribal and reservation resident survey conducted for the purpose of evaluating potential exposure pathways in the Upper Columbia River as part of the Upper Columbia River Remedial Investigation and Human Health Risk Assessment. The work was conducted under the authority of the CERCLA, 1980 and SARA 1986 Acts and in accordance with relevant work plans developed pursuant to the June 2006 Settlement Agreement signed by the United States and Teck Cominco American Incorporated. All data collection and informed consent procedures for the survey were approved by the Institutional Review Boards for the Environmental Protection Agency³. The Tribal Resource Consumption and Use Survey (CCT Survey) was completed in March 2011 and the final report is nearing completion. The survey includes relevant new data documenting fish

¹ Rayton, M. Personal Communication. 2012 Confederated Tribes of the Colville Reservation (CCT) Fish and Wildlife Department.

² Shallenberger, E. Rufus Woods Creel and Supplementation Project. 2009. Prepared for U.S. Department of Energy, Bonneville Power Administration.

³ Upper Columbia River Remedial Investigation and Feasibility Study Tribal Consumption and Resources Use Survey Draft Report. 2011. Submitted to the US EPA, Region 10 by Westat, Rockville Maryland.

consumption of tribal and reservation residents and is one of the largest ever conducted with a Tribal population.

A total of 1,783 reservation residents completed the required surveys (both Tribal members and non-member reservation residents). 82.98% of reservation population surveyed consumed fish in the last year. Of those fish consumed, 76.75% of reservation residents consumed salmon, 46.19% consumed trout, and 13.02% consumed walleye. Information about consumption frequency of fourteen other species of fish, shellfish (mussels, crawfish) and other aquatic species was gathered as well. Other significant findings include that tribal fishing and consumption have been suppressed due to various concerns about contamination and other factors. In our survey, reservation residents responded that they would eat more fish if not for contaminant concerns⁴.

Open Questions

Ecology's technical document raises the question of whether salmon should be considered in evaluating fish consumption rates, as they are migratory. Every life stage of the salmon is critical to fish health, survival and the bioaccumulation of contaminants which ultimately contributes to the contaminant body burden of tribal people.

Usual and Accustomed Fishing Areas

The definition of Usual and Accustomed Fishing Areas in the draft is not inclusive of all federally recognized Tribes of Washington State as it references the "1854 and 1855 negotiated treaties with Pacific Northwest native Americans in Washington State". The definition should be revised to include including all federally recognized tribes regardless of the mechanism by which they were established. The CCT was established by Presidential Executive Order. Specific to the CCT, Usual and Accustomed areas of the CCT within Washington State are vast and cover much of the lands and waters east of the Cascade Range. CCT tribal programs are implementing programs to provide more fish into the future for tribal subsistence consumption as well as providing an added benefit to non-tribal Washington residents.

A default fish consumption rate is a conservative rate and state risk driven standards can be driven to a more conservative value on a site specific basis. Any site specific revision to the state-wide default fish consumption rate must be towards a higher (more protective) rate of consumption, not a lower rate. Such is the case under Washington's MTCA, in which exposure parameters, specifically the default fish consumption rate, cannot be revised downward. While not strictly applicable to the Sediment Management Standards Rule (SMS), the basis for a single-sided default rate that can be adjusted on a site specific basis to be more but not less protective of human health is rooted in solid risk management principles and represents good public policy that CCT recommends will be incorporated into Section 173-204-571 of the SMS Rule.

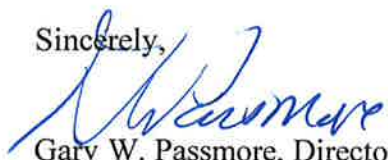
The structural link between the fish consumption rate that the State of Washington eventually adopts and its use within the proposed Sediment Management Standards as a key variable in setting human health based cleanup standards is, in the document's current iteration, weak, ambiguous and subject to challenge. Key terms and application scenarios that affect both

⁴ Environment International. 2012. Draft Upper Columbia River Resources Survey Food Questionnaire Data Report.

documents, such as Usual and Accustomed Areas and site-specific fish consumption rates must be consistently defined and their application specified in a manner that correctly cross-tracks, before CCT will support promulgation of the rule and supporting technical documents.

In conclusion, CCT survey data and other recent scientific data support a higher fish consumption rate. It is imperative that the State increase the fish consumption rate as the current rate is unrepresentative of true consumption patterns, and an increased rate will result in more protective and risk-appropriate clean up actions and healthier population.

Sincerely,



Gary W. Passmore, Director
Office of Environmental Trust



Nez Perce

TRIBAL EXECUTIVE COMMITTEE

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17 January 2011

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Via email to:
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Re: Draft Fish Consumption Technical Support Document

Dear Mr. Sturdevant:

The Nez Perce Tribe appreciates the opportunity to comment on the Washington Department of Ecology's Fish Consumption Technical Support document. We appreciate Ecology's interest in meeting with the Tribe in Lapwai, and understand that budgetary issues precluded this meeting. We expect that Ecology will continue to discuss these human health issues with the Nez Perce Tribe.

The Nez Perce Tribe has Treaty-reserved fishing rights pursuant to its 1855 Treaty with the United States (12 Stat. 957). The Tribe's usual and accustomed fishing places include places in Washington, Oregon, and Idaho; for example, the Tribe has fisheries in the mainstem Columbia and Snake Rivers and in tributaries throughout much of the Columbia-Snake River Basin. The importance of these fish to our people cannot be overstated: they are a major food source for members of the Nez Perce Tribe, and they are an integral part of our culture, our economy, and our way of life. These fish, and our people who depend upon them, require water quality in Washington, Oregon, and Idaho to be protected and enhanced to a level that protects water and fish from harmful exposure to toxic pollutants.

The Nez Perce Tribe has participated in and supported the Columbia River Inter-Tribal Fish Commission's (CRITFC's) comprehensive fish consumption study which documented that a fish consumption rate of 389 grams per day would be protective of 99 percent of the adult population and that a fish consumption rate of 176 grams per day would be protective of 95 percent of the adult population. The CRITFC fish consumption study documented that fish continue to be a mainstay of tribal diets.

The Tribe commends Ecology's report for examining relevant regional fish consumption rate studies including the CRITFC study. Ecology's report recommends a fish consumption rate in the range of 157 to 267 grams per day. The Tribe believes that Washington state standards should be at least as protective as the fish consumption rate of 175 grams per day recently approved by EPA for the state of Oregon.

Please understand that the Tribe believes that salmon, as well as other tribally significant aquatic species such as steelhead, lamprey and sturgeon, must be included in an overall fish consumption rate when assessing the risks from consumption of fish in order to accurately reflect tribal exposure to environmental toxics. Please refer to CRITFC's comments of December 21, 2011 on this issue.

Please understand that the Tribe is also very concerned about the relationship between the human health criteria and Ecology's development of "implementation tools." The Tribe believes that it is critical that both of these elements, and their relationship, are clearly described to the public and the Tribe.

Thank you again for the opportunity to comment. We look forward to further discussing these human health issues with you in the future.

Sincerely,



Brooklyn D. Baptiste
Chairman

cc: Dennis McLerran, Regional Administrator, EPA Region 10



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10**

1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
WATER AND WATERSHEDS

January 17, 2012

Mr. Kelly Susewind
Washington Department of Ecology
Water Quality Program Manager

Mr. Jim Pendowski
Washington Department of Ecology
Toxics Cleanup Program Manager

[Comments submitted electronically to fishconsumption@ecy.wa.gov](mailto:fishconsumption@ecy.wa.gov)

Re: Comments on Ecology's *Fish Consumption Rates Technical Support Document*

Dear Mr. Susewind & Mr. Pendowski:

This letter provides the Environmental Protection Agency's (EPA's) general comments on the Washington Department of Ecology's (Ecology's) process to undergo revisions to the state's fish consumption rate. Ecology has initiated this evaluation through the release of a draft report titled, *Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington* dated September 2011 and a request for public comments by January 18, 2012 on the draft document.

EPA would like to thank Ecology for the opportunity to provide comments on the draft document. This document provides a strong framework for your upcoming process to choose a fish consumption rate that more accurately reflects the fish and shellfish consumed by people in Washington. In turn, this rate may be used to adopt criteria that protect the health of those consumers. You and your staff should be commended for the quality, substance and readability of the document.

Defining appropriate fish consumption rates are critical to adopting water quality standards that ensure adequate human health protection. In Washington, this analysis affects future revisions to the state's Surface Water Quality Standards (WQS) at WAC 173-201A and Sediment Management Standards (SMS) at WAC 173-204 since both will involve protection of human health from toxic substances through criteria derived using a fish consumption rate. We look forward to our continued work with you throughout your revision processes to ensure that the criteria can be approved under the Clean Water Act.

Ecology currently recognizes two separate default fish consumption rates used to establish regulatory requirements:

- For cleanup actions, the Model Toxics Control Act (MTCA) Cleanup Regulations includes a default fish consumption rate of 54 grams per day. The SMS currently do not have numeric human health criteria, but instead rely on a narrative statement. (Ecology expects that upcoming revisions to the SMS will utilize a fish consumption rate to calculate numeric human health criteria.)
- For water quality standards, the Surface Water Quality Standards are based on the National Toxics Rule (NTR) which sets water quality standards for human health criteria based on a fish consumption rate of 6.5 grams per day.

The water quality standards regulation at 40 C.F.R. 131.11(a) requires states to adopt water quality criteria to protect all designated uses. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. In 2000, EPA updated its methodology for deriving human health criteria (2000 Methodology).¹ In that document EPA urges states and tribes to use a fish intake level derived from local or regional data. Consideration of local data is important to ensure protection of the local populations, especially when that population includes subpopulations that eat larger quantities of fish and shellfish. A four preference hierarchy concerning the use of fish consumption rate data is set forth: (1) use of local data; (2) use of data reflecting similar geography/population groups; (3) use of data from national surveys; and (4) use of EPA's default intake rate of 17.5 grams per day if no state/site-specific information is available.

Washington's human health criteria were issued by EPA in 1992 and derived using a fish consumption rate of 6.5 grams per day. As identified in your draft document, several studies of Northwest populations indicate that this rate is not reflective of the amount of fish and shellfish consumed by some in the state of Washington. Therefore, it is appropriate and consistent with EPA guidance for Ecology to examine the current science to determine an appropriate fish consumption rate to use for deriving criteria protective of the state's designated uses. EPA recognizes that Ecology has begun this process in the draft *Fish Consumption Rates Technical Support Document* and believes it is important for you to use the recommendations presented in this document along with the comments received to determine an appropriate rate to use in deriving the human health criteria in your SMS and WQS.

In the draft *Fish Consumption Rates Technical Support Document* a preliminary recommendation for a revised fish consumption rate in the range of 157 to 267 grams per day is proposed for use in the state's regulations. This range is primarily based on Ecology's evaluation of four studies:

- *A Fish Consumption Survey of the Umatilla, Nez Perce, Yakama, and Warm Springs Tribes of the Columbia River Basin* (Columbia River Inter-Tribal Fish Commission, 1994).
- *A Fish Consumption Survey of the Tulalip and Squaxin Island Tribes of the Puget Sound Region* (Toy et al., 1996).

¹ EPA. 2000. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health*. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-822-B-00-004. Available at: <http://www.epa.gov/waterscience/criteria/humanhealth/method/complete.pdf>.

- *Fish Consumption Survey of the Suquamish Indian Tribe of the Port Madison Indian Reservations, Puget Sound Region* (Suquamish Tribe, 2000).
- *Asian and Pacific Islander Seafood Consumption Study* (Sechena et al., 1999).

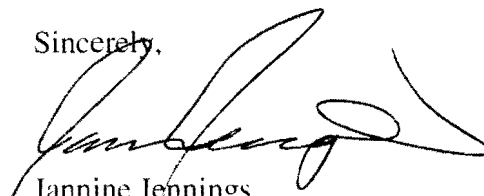
To reiterate, EPA believes the approach for developing a revised fish consumption rate should be based on current scientific information and local/regional data. The initial approach put forth in the draft report is aligned with this thinking. While we understand the need for continued coordination with your stakeholders and the Tribes, we encourage you to quickly incorporate this information into your rulemaking process and move forward with adopting revised criteria.

EPA is aware that Ecology has been following the work previously completed in Oregon to make similar revisions to their WQS involving a revised fish consumption rate based on 175 grams per day and associated new and revised implementation tools. The revisions to Oregon's WQS were approved by EPA on October 17, 2011. To avoid duplication of efforts, we recommend that you continue to consult with the state of Oregon as you move forward.

EPA urges Ecology to continue the process of revising Washington's human health criteria in a timely manner. However, EPA recognizes that several key questions still need to be decided. For example, Ecology will need to decide on implementation tools in order to put into practice revised human health criteria and Ecology will need to decide if a consistent number will be chosen for the state's SMS and WQS. Nonetheless, EPA believes the information is currently available to make decisions on these matters and requests Ecology to quickly move through the process necessary to do so. EPA remains committed to working with Ecology, the Tribes and Washington's stakeholders to facilitate the adoption of water quality criteria that reflect appropriate fish consumption rates for Washington's waters and are protective of human health.

Since this is a priority for EPA Region 10, we are available and willing to work closely with you throughout your human health criteria update process. EPA greatly appreciates your engagement on this significant topic. Please feel free to contact me at (206) 553-2724 or have your staff contact Matthew Szelag at (206) 553-5171 as we continue to move forward on this important effort.

Sincerely,



Jannine Jennings
Manager, WQS Unit
Office of Water and Watersheds



Pope Resources
A Limited Partnership

19245 Tenth Avenue Northeast
Poulsbo, Washington 98370-7456
(360) 697-6626
(360) 697-1156 FAX

January 17, 2012

Mr. Ted Sturdevant, Director
Washington State Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Re: Draft Fish Consumption Rate

Washington's surface water and sediment quality standards, including standards designed to protect those who consume fish and shellfish from our regional waters, are currently among the most restrictive in the nation. While over the last 30 years Washington's water quality and cleanup programs have resulted in substantial environmental improvements that have been the envy of many other regions in the U.S., the high fish and shellfish consumption rates being considered here will have the unintended consequence of diverting the positive energies being applied to environmental cleanup to regulatory gridlock and unproductive litigation.

For example, adoption of the high consumption rate values being considered by the Department of Ecology, when combined with current (and proposed) risk assessment methodologies, would inappropriately set "zero discharge" requirements and define most of Puget Sound as a "cleanup" site because concentrations are greater than natural, pre-development conditions. This is inconsistent with local, state, and national health recommendations that encourage seafood consumption for health reasons (even with the low levels of contaminants that are present in our waters and in our markets), and background-based cleanup standard that is not achievable, or affordable. What is more likely to occur as a result of these proposed consumption rate changes is regulatory gridlock, where real environmental achievements take a back seat to litigation fueled by setting standards that cannot currently be achieved.

If the Department of Ecology elects to still go ahead with changes to the fish and shellfish consumption rates, we offer two specific recommendations to limit the potential for unintended consequences of such an action:

1. The fish and shellfish consumption rates should be specific to the species being consumed. Salmon make up the overwhelming portion of the total in the Pacific Northwest, and numerous studies have shown that salmon accumulate most of their body burden of bioaccumulative contaminants such as PCBs and dioxins/furans during their first few years of life while they are at sea. Therefore, any change in Washington regulations will not impact what bioaccumulates in salmon. The appropriate focus of the fish and shellfish consumption rate for both the water quality and cleanup programs should be on shellfish and non-migratory finfish species. This needs to be made very clear in the Department of Ecology's fish consumption rate document.

2. Similarly, the water quality and cleanup programs need to adopt consumption rates that are relevant to the small geographic areas that are the focus of these programs. Given the wide range of sources (including our neighborhood markets) that we all use to obtain fish and shellfish for consumption, there is no rational reason to assume that an individual would obtain 100 percent of their diet of these species from a single, small geographic area. The diet fraction currently used in the cleanup (MTCA) regulation of 50 percent for risk assessment calculations is already highly conservative, as the Department of Ecology pointed out during the original promulgation of the MTCA regulation.

We have long supported the state's efforts to restore Puget Sound through the efforts of the Department of Ecology and the Puget Sound Partnership. This monumental effort requires the strategic use of available funds to achieve the most widespread impacts. We also recognize that we're in a time of limited resources and budget constraints, which creates the imperative that we spend wisely and support cleanup measures that provide the greatest public health and environmental benefit in an efficient and cost-effective manner. We believe that the new proposed rules are not achievable and would result in over-allocating finite resources to attempt to reach an unattainable goal. We would in effect be wasting valuable and finite resources chasing ever diminishing returns, and as a result funds would be taken away from other viable cleanup efforts. Ultimately this would come at the expense of real restoration in other parts of the Puget Sound.

Thank you for considering our comments.

Sincerely,



David L. Nunes
President and CEO

January 17, 2012

Submitted via email to: fishconsumption@ecy.wa.gov

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Subject: Comments on Publication No. 11-09-050, Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington
Project No. 0900083.026

To: Washington State Department of Ecology

The Washington State Department of Ecology (“Ecology”) released a draft of the report, *Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington* (“TSD”) in September 2011.¹ The TSD summarizes available fish consumption studies for high-end fish consumers in the Northwest and related issues. Based on its review of the five available fish consumption studies, Ecology recommended a default fish consumption rate between 157 and 267 g/day. The recommendations from this report will be used in ongoing revisions to State Sediment Management Standards (SMS) and Surface Water Quality Standards (SWQS). The following comments are provided in response to Ecology’s request for public input on the TSD.

1. Site-specific Application to Sediment Cleanup Levels: Defining Background and Site Boundaries

At many, if not all cleanup sites in Puget Sound, sediment polychlorinated biphenyl (PCB) and dioxin concentrations would exceed cleanup criteria based on the current Model Toxics Control Act (MTCA) default fish consumption rate of 54 g/day. In fact, as noted by Jim West of the Washington State Department of Fish and Wildlife in his presentation at Ecology’s Technical Workshop on Fish Consumption, most Puget Sound fish included in the state monitoring program have PCB concentrations above a fish tissue PCB criterion based on even the 1980 ambient water quality criteria fish consumption rate of 6.5 g/day (70% of English sole, 90% of

¹ Ecology. 2011. Fish consumption rates technical support document, a review of data and information about fish consumption in Washington. Publication no. 11-09-050, Version 1.0. September 2011. Washington State Department of Ecology.

coho, and 100% of Chinook and herring).² More than 50% of freshwater fish in the state would exceed such a criterion. Virtually all fish in state waters would exceed a PCB fish tissue criterion based on the current MTCA default fish consumption rate of 54 g/day and, by extension, virtually all sediments in state waters would exceed a PCB criterion based on the MTCA default fish consumption rate. Therefore, cleanup levels at these sites would default to background.

As another example, the current methylmercury fish tissue criterion for protection of human consumption of fish is 0.3 mg/kg and is based on a fish consumption rate of 17.5 g/day. According to data summarized by EPA from 1990 to 1995, that represents approximately the 80th percentile for fish tissue mercury concentration for all fish in Washington State.³ Application of the MTCA default fish consumption rate of 54 g/day would produce a fish tissue mercury criterion of approximately 0.09 mg/kg, which corresponds to less than the 30th percentile for fish in Washington. In other words, mercury concentrations in approximately 70% of Washington State fish would exceed the criterion. Virtually all fish in Washington State would exceed a fish tissue mercury concentration based on a consumption rate in the range recommended in the TSD, as would most fish from any source because background fish mercury concentrations would exceed the criterion. The most recent data from Ecology's freshwater fish mercury monitoring programs indicates a similar relationship.⁴ Mercury levels in 14% of bass collected from freshwater bodies in Washington State exceeded the current water quality criterion of 0.3 mg/kg. Over 60% would exceed a criterion based on the current MTCA default fish consumption rate and 100% would exceed a criterion based on the low end of Ecology's recommended subsistence fish consumption rate range.

However, defining background for these chemicals provides a significant challenge to Ecology. It will require additional regional or site-specific analyses that will be difficult and costly to perform. In addition, MTCA defines the site boundaries (WAC 173-204-560 (4)(b)(i)) to include those areas where the individual contaminants exceed the applicable sediment quality standards as defined in WAC 173-204-320 through 340. This includes chemical and biological criteria. If we establish background as the cleanup level for these chemicals then the definition of a site boundary becomes even more difficult.

² Ecology. 2011. Technical workshop on fish consumption in Washington. December 12, 2011, University of Washington South Campus Center, Seattle. Washington State Department of Ecology.

³ U.S. EPA. 1999. The National Survey of Mercury Concentrations in Fish, Data Base Summary 1990-1995. EPA-823-R-99-014. Office of Water, Washington, D.C. Percentiles estimated from graph of Washington State data provided.

⁴ Ecology. 2010. Measuring Mercury Trends in Freshwater Fish in Washington State, 2009 Sampling Results. Washington State Department of Ecology. Publication No. 10-03-058. Percentiles calculated based on individual largemouth and smallmouth bass concentrations estimated from Figure 5 of the document.

Recommendations

A discussion should be provided in Chapter 7 regarding the impact that fish consumption rates have on the establishment of site cleanup criteria to background levels and the impact this has on developing site boundaries.

2. Interpreting Fish Consumption Survey Data for Regulatory Decision Making

Risks of concern for seafood ingestion include those that might result from life-long exposure. Fish consumption intake rates that are used for calculating fish consumption criteria must therefore represent an average daily intake over a long time period up to a lifetime, rather than a short-term (e.g., 24 hour period). Accurate measurement of usual daily food intake over a long-term period is a difficult undertaking. All standard dietary survey study designs are subject to limitations. Results can be highly influenced by participants' perceptions of how the data will be used, whether the food is "good for you" or not, and the expectations of the surveyor. Other important issues that must be assessed are survey method, sample size of individuals, number of survey days, and timing of the survey period relative to related events (e.g., harvest seasons and festivals). Therefore, it is extremely important that studies are peer-reviewed and that the limitations are evaluated in the context of how the results will/can be used. This is particularly important when a study is being considered to set practical public health policy.

These challenges can be illustrated with one of the primary studies considered by Ecology in the TSD, the Suquamish study.⁵ As with all dietary survey studies, the Suquamish study has limitations that should be assessed and described in the context of how the results will be used. Ecology indicates in the TSD that studies were evaluated for: 1) survey methodology, 2) survey execution, 3) publication of results, 4) applicability and utility for regulatory decisions (for example, representativeness of the population surveyed relative to the regulatory decision), and 5) technical suitability for the decisions.

Survey Methodology and Execution

The primary survey instrument used in the Suquamish study to derive consumption rates was a food frequency and portion size survey. This type of survey asks participants to estimate the frequency at which they ate specific fish and shellfish species over the previous week (i.e., meals per day, week, or year) and the portion size of the typical meal. In addition, participants were also administered a 24-hour recall, in which participants are asked to recall what fish or shellfish they ate and how much during the last 24 hours only. The 24-hour recall results were not used to derive the final recommended consumption rates, but rather were provided for

⁵ Suquamish Tribe. 2000. Fish consumption survey of the Suquamish Indian Tribe of the Port Madison Indian Reservations, Puget Sound Region. Suquamish Indian Trip.

comparison and validation. There are strengths and weaknesses with each survey method. For example, the food frequency covers a longer period of time so may be able to reveal long-term patterns, but accuracy of recall suffers over the longer period of time. The 24-hour recall is likely to more accurately reflect intake during the survey period (i.e., 24 hours), but may miss out on daily variation on an individual level or seasonal variation on a population level.

In the Suquamish study, 55% of participants reported no seafood consumption in the 24 hours prior to taking the survey. Correspondingly, the mean consumption rate measured in the 24-hour recall portion of the study (1.5 g/kg-day) was nearly half the consumption rate estimated in the food frequency survey (2.7 g/kg-day). The lack of seafood consumption during the 24-hour recall survey period does not, however, indicate those respondents are non-consumers in general because the food frequency survey revealed that all participants were seafood consumers. Study authors concluded that the “lower mean consumption rate for dietary recall suggests that a brief set of questions does not uncover all forms of consumption.” However, this conclusion is not supported by scientific literature on dietary surveys. Although on an individual level the 24-hour recall does not capture day-to-day variability; on a population level it may provide a more accurate account of the consumption rate than the food frequency survey instrument. This type of dietary assessment (i.e., the 24-hour recall) has been shown to accurately reflect dietary patterns.⁶ Retrospective diet history surveys, such as the Suquamish food frequency questionnaire that looked back over a year, may be more likely to overestimate usual consumption.⁷ Results should be validated by summing reported consumption for individual food items, along with food groups not included in the survey, to determine if reported intake is consistent with energy requirements. Ideally, multiple non-consecutive day 24-hour recall surveys would be administered to study participants over a longer period of time to capture seasonal and individual variability. For example, Nobmann et al. (1992) conducted a study on dietary intake in Native Alaskans from 10 communities throughout Alaska. Their methodology included the use of multiple 24-hour recall surveys, completed during five seasons over an 18-month period. Nobmann et al. (1992) reported the typical caloric intake for native Alaskans as approximately 2,750 kcal per day for men and 1,950 kcal per day for women (Table 5-12; Nobmann et al. 1992). Caloric intake in the general U.S. population during that time period was approximately 2,550 kcal per day for men and 1,550 kcal per day for women (NHANES II, as reported in Nobmann et al. 1992).⁸ Results would be validated with a small subset of participants completing diet records with weighed meals.

⁶ Witschi, J.C. 1990. Short-term dietary recall and recording methods. p. 52–68. In: *Nutritional Epidemiology: Monographs in Epidemiology and Biostatistics*. W. Willett (ed). Oxford University Press, New York, NY.

⁷ Rasanen, L. 1979. Nutrition survey of Finnish rural children. VI. Methodological study comparing the 24-hour recall and the dietary history interview. *Am. J. Clin. Nutr.* 32(12):2560–2567.

⁸ Nobmann, E.D., T. Byers, A.P. Lanier, J.H. Hankin, and M.Y. Jackson. 1992. The diet of Alaska Native adults: 1987–1988. *Am. J. Clin. Nutr.* 55:1024–1032.

Publication of Results

The Suquamish study has not received the benefit of a formal, external peer-review, nor has it been published in a peer-reviewed journal. Equally important, for data that will be used as the basis of public health policy applicable to the general public, a transparent public review process is critical. However, because it is a tribal study, data from the study are not available to the public. In addition, the study report itself has not had the benefit of a public review and comment process to evaluate study design, results, and applicability for use in public health decision making.

Applicability for Regulatory Decisions

Regulatory criteria and associated risk assessment methods typically rely on the use of reasonable maximum exposure (RME) assumptions in order to provide a high degree of public health protection. As noted in the TSD, “The RME is designed to represent a high end (but not worst case) estimate of individual exposures. It provides a conservative estimate that falls within a realistic range of exposures....The RME is defined as reasonable because it is a product of several factors that are an appropriate mix of average and upper-bound estimates. RME estimates typically fall between the 90th and 99.9th percentile of the exposure distribution.” In other words, when all assumptions are taken together, the resulting exposure estimate should be in the range of the 90th and 99.9th percentile. Therefore, each individual input (e.g., fish consumption rate, fish diet fraction, exposure duration) need not be at the high end of the distribution for the overall exposure estimate to be at the high end of the distribution. Ecology applies a RME in the range of the 90th to 95th percentiles for deriving cleanup standards, and has historically recommended use of a fish consumption rate representative of the 90th percentile for a given population or study.⁹ The 90th percentile is consistent with the U.S. FDA’s designation of high-end consumption rates as the 90th percentile from large national, 2 to 3 nonconsecutive day surveys of food intake by thousands of individuals.¹⁰

The specific percentile selected should be considered on a study-specific basis and will depend on such factors as the characteristics of the data distribution and the representativeness for the study population to which the fish consumption rate will be applied. In the case of the Suquamish study, the study population appears to be high-end consumers even compared with other high fish consuming populations included in the TSD. Even within the Suquamish study population, the data are highly skewed and the upper percentiles (90th and 95th) are greatly affected by a few individuals with very high reported intakes.

⁹ Ecology. 1999. Analysis and selection of fish consumption rates for Washington State risk assessments and risk-based standards. Publication No. 99-200. March 1999. Washington State Department of Ecology.

¹⁰ U.S. FDA, 2006. Estimating dietary intake of substances in food.
<http://www.fda.gov/food/guidancecomplianceregulatoryinformation/guidancedocuments/foodingredientsandpackaging/ucm074725.htm> Accessed January 13, 2012. Last updated August 2006. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition.

The intent of the RME approach is to ensure protection at the upper end of a distribution that includes the entire population (or in the case of fish consumption, all people who consume fish). A 95th (or 90th) percentile intake from the Suquamish study represents the high-end intake from one of the highest consuming groups. This rate would likely represent well over the 99th percentile consumption rate for fish consumers in Washington and result in an RME estimate even higher. Even a 50th percentile consumption rate from the Suquamish study (~100 mg/day, excluding salmon) would provide a high-end exposure estimate for Washington fish consumers as a whole. Ultimately, the choice of specific percentiles of a population distribution, and on which population to base a RME estimate, is a policy decision that is not based solely on science. For example, public health policy makers have chosen to base soil cleanup levels on high-end soil ingestion estimates for a typical child rather than for children with pica, a significant subpopulation that ingests soil at a rate perhaps 10-times or more than the typical child.

Technical Suitability

Two issues should be addressed when considering the technical suitability of the Suquamish study for regulatory decision making. First, as discussed previously, the two survey instruments used in the Suquamish study resulted in very different fish consumption estimates. Which estimate is closer to actual typical daily consumption over a lifetime was not evaluated in the original study or in subsequent reviews by the U.S. Environmental Protection Agency or Ecology. Rather, higher estimates provided by the food frequency questionnaire were assumed to be more representative. Two survey instruments were included in the study to, at least in part, provide validation of the results. That results provided by the two instruments were not in accordance should raise questions about the methodology used, the accuracy of the results, or both.

Second, fish consumption rates should reflect the reality of metabolic energy needs over long time periods (i.e., how much food does a person need and how much can they reasonably consume to maintain weight, health, etc.). The amount of fish consumption must make sense in the context of the entire diet. Unfortunately, the Suquamish study, like the other available fish consumption studies, considers only fish and shellfish consumption and not total diet. Without understanding the usual intake of other foods, it is not possible to accurately assess the results, particularly with regard to factors that may shift the overall distribution of consumption rates because of systematic biases. The daily energy requirement of an active adult male of average size is approximately 2,900 kcal/day¹¹; more for a larger or more active person and less for a smaller or less active person. Ideally, a survey assessing usual intake of most/all foods would be administered to at least a subset of study participants in order to validate the fish

¹¹ Average caloric energy requirements as calculated on U.S. FDA *Human Fluid and Caloric Requirements* calculator for a person with a height of 5'10" and weight of 70 kg.
<http://www.accessdata.fda.gov/scripts/cder/onctools/caloricquery.cfm>

consumption estimates. A similar analysis could be conducted regarding limits to the amount of protein intake that could be sustained over a longer time period. In the absence of such data, results should at least be evaluated using other means of estimating total diet intake (e.g., follow-up studies in the survey group, literature values for similar populations).

Discussion of the Suquamish study is provided as an example, but the same issues should be considered for all of the studies included in the TSD. However, the issues stand out more distinctly with the Suquamish study because the estimated consumption rates are significantly higher when compared with the other studies.

Recommendations

A more in depth, critical evaluation of the available fish consumption studies should be conducted addressing, among other issues, those identified in the preceding discussion of the Suquamish study. The Suquamish study, in particular, requires further evaluation in light of the internal validation issues presented by the difference in results from the two survey instruments utilized. More generally, data and studies that will be used to set public health policy for all Washington residents warrant a more open public access and review policy.

3. Should Salmon be Included in a Default Fish Consumption Rate

The TSD devotes considerable effort in evaluating the relative contribution of Puget Sound, estuarine, and freshwater environments to salmon contaminant body burden. Ultimately, the question is to what degree Washington waters/sediments contribute to salmon chemical body burden. If it is a significant contribution, salmon consumption would logically be included in the fish consumption rate used to derive sediment and water quality criteria. If not, salmon should be excluded from the fish consumption rate in the same way that store bought fish is excluded. The information provided in the TSD (and Appendix E of the TSD) appears to support the conclusion that for most salmon, body burden of bioaccumulative chemicals (e.g., PCBs, dioxins, mercury) derives mostly from marine waters. However, Washington waters/sediments may contribute to body burden depending on the species, run, chemical, life cycle characteristics, and a range of environmental physical characteristics. This variability, dominated by a lack of significant contribution, argues for evaluating the situation on a site-specific basis with exclusion of salmon being the default.

Recommendation

Exclude salmon consumption from the default fish consumption rate, but evaluate whether it should be included on a site-specific basis.

4. Implications for Risk Communication and Public Health

Ecology acknowledges that implications of the TSD on regulatory programs are not considered. However, the fish consumption data reviewed in the TSD would result in significant changes if implemented in the SMS, SWQS, and MTCA. Use of high subsistence-level fish consumption rates to set statewide standards for water, sediment, and/or fish tissue will result in elevated risks from background concentrations of several priority pollutants (e.g., mercury, PCBs, dioxins). This will imply that consumption of fish from any water body in Washington State, or even fish from the grocery store is unsafe. This is a challenging risk communication issue and potentially a detriment to public health if it results in people eating less fish.

It is unclear whether use of subsistence fish consumption rates for sediment and water quality standards would result in a public health benefit. As noted above, sediment criteria for chemicals such as PCBs, dioxins, and mercury are likely to be based on background concentrations. Thus, any increase in the assumed fish consumption rate would not result in a lower sediment cleanup levels for these chemicals. But it would result in higher estimated risks associated with eating fish and, as noted above, a significant public health and risk communication challenge. Given that the vast majority of Washington residents consume much less fish than the highest subsistence consumers on which Ecology is considering basing the new recommended consumption rate, the resulting criterion would be misleading with regard to potential health risks faced by Washingtonians. The estimated risks may also lead people to believe that no fish should be consumed.

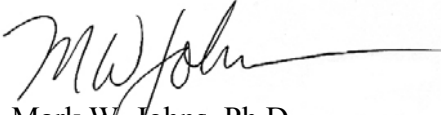
Recommendations

The TSD should include a risk-benefit analysis addressing: 1) how the recommended fish consumption rate(s) will be implemented in regulatory framework (SMS, SWQS, MTCA), 2) the level of public benefit expected, and 3) the potential public health risk if people eat less fish.

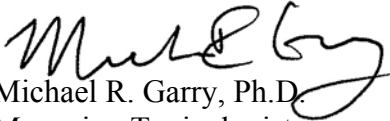
Washington State Department of Ecology
January 17, 2012
Page 9

We appreciate the work Ecology has expended in this document and look forward to receiving Ecology's response to the comments presented in this letter.

Sincerely,

A handwritten signature in black ink, appearing to read "MW Johns", with a long horizontal flourish extending to the right.

Mark W. Johns, Ph.D.
Principal Scientist

A handwritten signature in black ink, appearing to read "Mike Garry", with a large, stylized "G" and a horizontal flourish.

Michael R. Garry, Ph.D.
Managing Toxicologist



January 17, 2012

Ms. Martha Hankins
Washington State Department of Ecology
Toxics Cleanup Program
300 Desmond Drive
Lacey, WA 98503

RE: Comments on the Fish Consumption Rates Technical Support Document, Version 1.0 prepared by the Washington State Department of Ecology, Toxics Cleanup Program, dated September 2011.

Dear Ms. Hankins:

Lockheed Martin Corporation (LMC) has been actively involved in sediment cleanup projects in the Pacific Northwest, including Washington State. As such, we appreciate the opportunity to comment on the Fish Consumption Rates Technical Support Document, Version 1.0 as prepared by Washington Department of Ecology (Ecology) Toxics Cleanup Program dated September 2011. As stated in the problem statement of the technical support document, this document has been prepared in support of and in conjunction with ongoing revisions of the Washington State Sediment Management Standards (SMS) (Washington Administrative Code [WAC] 173-304). The text of the problem statement also states that the adopted fish consumption rates may also be used in consideration of future revisions of the Washington Water Quality Standards for Surface Water (WAC 173-201A) and the Washington State Model Toxics Control Act (MTCA) (WAC 173-340).

LMC's comments on the fish consumption rate technical support document are summarized below, and are organized under two primary topics, including 1) reliance on EPA Region 10 Tribal Framework and 2) overly conservative estimate of risk. Our comments are accompanied by reference to the corresponding document chapter, topic, and page(s) for convenience.

1. RELIANCE ON EPA REGION 10 TRIBAL FRAMEWORK

The EPA Region 10 Framework for Selecting and Using Tribal Fish and Consumption Rates is cited repeatedly in Ecology's fish consumption rates technical support document, and was used to help develop the range of fish consumption rates. The EPA Framework title states that it is a "working document to be applied in consultation with Tribal Governments on a Site-Specific Basis." The EPA Region 10 Tribal Framework does not state that it represents final EPA guidance or policy or that it has been subject to internal or public review and approval. EPA has a federal government trust responsibility to assure that tribal concerns and interests are considered whenever EPA's actions and/or decisions may affect Tribes (particularly on tribal lands). Washington State Department of Ecology does not have this same trust responsibility. For these reasons, it appears inappropriate for the framework to serve as a primary basis for selection of state fish consumption rates and related rulemaking in Washington State (*Chapter 5, EPA Region 10 Framework, pages 78 through 79*).

2. OVERLY CONSERVATIVE ESTIMATE OF RISK

From a sediment cleanup perspective, adoption of the recommended range in fish consumption rates will result in closer to a worst-case scenario based on protection of a very small portion of the population than a reasonable maximum exposure (RME) scenario as defined under MTCA (i.e. the highest exposure that is reasonably expected to occur at a site). In many cases, the high seafood consumption rate associated with that population is not occurring or is not possible at a particular site or site area.

Ecology has defined the fish consumption rates based on the RME of the high-fish consumer population (90 and 95 percentile of the Tribal and Asian Pacific Islander seafood consumption rate surveys) regardless of the source of the seafood being consumed, rather than the RME of the statewide fish consuming population that consumes seafood from Washington waters. For this reason, the selected consumption rates represent more of a worst-case scenario than a RME scenario (*Chapter 5, Reasonable Maximum Exposure defined under MTCA, page 75, Choice of the Reasonable Maximum Exposure, page 109*).

The following factors related to seafood consumption rates also contribute to overly conservative determinations of human health risks under MTCA:

Inclusion of Salmon in Default Seafood Consumption Rate. From a sediment cleanup perspective, salmon are migratory and spend the vast majority of their lives in the open ocean where they are not exposed to localized site-related contaminants. Because the uptake of specific contaminants into biota from contaminated sediment is complex and the biota do not always reside through their complete lifecycle at a given site, the contaminated sediments at a particular site may not impact the seafood being consumed. Although the document states that salmon are recognized to not reside in most areas of the Sound, Ecology's recommended range of seafood consumption rates is based on total fish consumption including salmon. For a location with no resident salmon, that inclusion may result in a sediment cleanup action that does not result in any risk-reduction for people eating seafood harvested from the location. For these reasons, the default seafood consumption rate should not include salmon (*Chapter 7, The Question of Whether to Include Salmon, pages 108-109*).

Risk Assessment Issues Identified During Ongoing Sediment Cleanups. In addition to providing a framework for the selection of seafood consumption rates, the EPA Region 10 Tribal Framework also includes assumptions and guidance on how the consumption rates will be applied in human health risk assessments (a key technical and regulatory issue). Concerns regarding whether sediment cleanup level may represent more of a worst-case scenario as opposed to a RME are highlighted by ongoing Puget Sound EPA-led cleanups as well as recent EPA presentations in which EPA has specified that site-specific risk assessments under the Region 10 Tribal Framework include the following assumptions: 1) harvested fish and shellfish represented by consumption rate are assumed to have originated at the site and could be impacted by site-related contaminants; the same consumption rate is used regardless of the site size and its proximity to actual seafood harvest areas, 3) use of the same overall consumption rate regardless of species actually present at the site (a secondary related assumption is that Tribes will harvest alternate species if desired species are not present), and 4) an adopted exposure duration of 70 years, rather than EPA typical default value of 30 years to account for Tribal lifestyles. Routine application of the EPA Region 10 Tribal Framework risk assessment approach will result in overly

conservative sediment cleanup levels that represent more of a worst-case scenario than a RME developed under MTCA (*Chapter 5, EPA Region 10 Framework, pages 78 through 79, Chapter 6, Fish Diet Fraction, page 98, first bullet*).

Sediment Cleanup Levels Below Background Concentrations. Recent risk assessments for sediment sites in Puget Sound urban areas also show that the range of background concentrations of bioaccumulative contaminants in sediment in urban areas (e.g., PCBs) exceed acceptable levels based on risk as calculated using a similar proposed range of seafood consumption rates and the EPA Region 10 Tribal Framework risk assessment approach. For this reason, MTCA risk-reduction goals for these chemicals cannot be attained through remediation. This problem greatly complicates remedy selection and increases the timeframe and expense for completing a sediment cleanup and evaluating its effectiveness (*Chapter 5, Sediment Management Standards, page 76*).

Estimation of High-Fish Consumers. The document estimates the number of high fish consumers (the most sensitive receptors) that would be protected by the change in fish consumption rates and lacks any comprehensive survey data to support this estimate. The estimate also includes fish consumers that do not obtain their fish from Washington waters and therefore is overly conservative. Based on review of the document, comprehensive state-wide survey data are needed to establish technically defensible seafood consumption rates that more realistically reflect the seafood consumption rate of the overall Washington population (*Chapter 2, High-Fish Consuming Populations, pages 2 through 27*).

Origin of Consumed Seafood. The document does not adequately specify the amount of consumed seafood that comes from waters of Washington State versus other locations (e.g., Alaska), the amount from commercial aquaculture operations in Washington and elsewhere, and the amount of consumed seafood representing natural resources of Washington state (i.e., the amount of seafood living in an uncontrolled environment that may be exposed to environmental contaminants). The seafood consumption rate is most reasonably defined based on the seafood representing natural resources of Washington State. The recommended range of fish consumption rates is overly conservative because the rates were not adjusted to account for the percentage of seafood consumed that originates in other locations. Further surveys should be performed if adequate data are unavailable (*Chapter 2, High-Fish Consuming Populations, pages 2 through 27*).

The text states that traditional fishing areas for tribes cover essentially all of Washington. While this may be true based on treaty rights, it appears that the majority of the fishing and seafood harvesting (particularly subsistence fishing and seafood harvesting) occurs in significantly less areas of the state. It does not appear technically justifiable to apply a high-fish consumer seafood consumption rate (that likely includes subsistence fishers) to all locations in Washington when not all locations are used or can be used (due to their ecologic productivity) for this purpose. (*Chapter 2, Washington Native American Tribes, page 27*).

Representativeness of Surveys. The combined population of Washington State Native American Tribes and Asian-Pacific Islanders (API) is 625,411 people and the high-fish consuming adult population is assumed by Ecology to be between 146,000 and 381,000 people (Refer to Chapter 2). Table 21 shows that survey results for only 1,188 people (of a population of about 6.7 million in Washington State) were included as the data set to determine the revised consumption rates. Ecology's recommended range of consumption rates (157 to 267 g/day) overlaps with both the 90th or 95th percentiles of the Table 21 data set, and represents a very small number of people relative to the survey size of 1,188 people. The range of seafood consumption rates for the 90th or 95th percentiles is variable

Ms. Martha Hankins
January 17, 2012
Page 4

(113 to 489 g/day). From a sediment cleanup perspective, variations in the seafood consumption rate can significantly impact the outcome of risk assessments. A more comprehensive survey of seafood consumption patterns should be performed, before revised default fish consumption rates are selected for adoption (*Chapter 4, Table 21, Summary of Fish Consumption Rate Surveys Considered by Ecology, page 71*).

LMC appreciates the opportunity provided by the Washington State Department of Ecology to comment on the Fish Consumption Rates Technical Support Document and may provide additional comments at other points in the review process.

Sincerely,



Gene Matsushita
Senior Manager, Environmental Remediation

January 12, 2012

RE: Comments on Fish Consumption Rates Technical Support Document: A Review of Data and Information about Fish Consumption in Washington (Publication 11-09-050)

To Whom It May Concern,

Thank you for the opportunity to comment on Washington State Department of Ecology's (Ecology) Fish Consumption Rates Technical Support Document (Publication 11-09-050), which Ecology will use as it considers updates to the Water Quality Standards for Surface Waters and the Model Toxics Control Act Cleanup Regulation. As you know, the harvest, consumption and ceremonial use of fish and shellfish is a fundamental part of coastal tribal culture, and the Jamestown S'Klallam Tribe views determining accurate fish consumption rates as a high priority. We appreciate the attention that Ecology staff members are giving to this important issue and the participation of all interested parties in the related discussions. Our main comments are listed below.

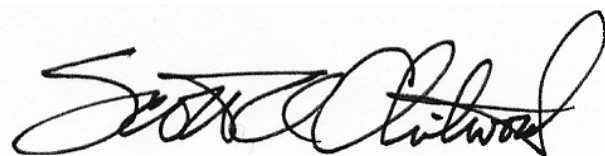
- The Jamestown S'Klallam Tribe has been involved in meetings and workshops relevant to fish consumption rates, some of which have been sponsored by the Northwest Indian Fisheries Commission (NWIFC), from the beginning. **The Jamestown S'Klallam Tribe contributed to and supports the recent comment letter (dated January 3, 2012) submitted by the NWIFC on behalf of the tribes, and we incorporate those points within this letter.**
- **Unfortunately, our Tribe is intimately aware of how pollution and habitat loss, among other factors, can impact tribal citizens' ability to harvest and consume fish.** Dungeness Bay, one of the Jamestown S'Klallam Tribe's traditional shell-fishing grounds, has had multiple closures due to bacteria pollution, and the oyster farm we operated there was ultimately shut down because of it. Other shellfish areas within the Tribe's Usual and Accustomed fishing areas (U&A) are closed because of proximity to permitted discharges, and the potential pollution load. **In addition to shellfish pollution, loss of habitat for salmon has played a role in suppressing the fish consumption rate for citizens of the Jamestown S'Klallam Tribe.** The Tribe has been working for over 25 years to help restore stream flows in the Dungeness River and other streams in our Usual and Accustomed fishing areas (U&As), particularly those that are home to species listed under the Endangered Species Act (ESA). The Dungeness River, for example, is home to numerous salmonid species, four of which are ESA-listed as threatened: Spring/ Summer Chinook, Summer Chum, Bull Trout and steelhead. Dungeness River stream flows are impaired for a variety of reasons, which stakeholders are trying to address. Simply stated, reduced flows are directly related to diminished fish habitat resulting in a lower abundance of fish. **A reduced fish consumption rate for the Jamestown S'Klallam Tribe is the culmination of these (pollution and habitat) and other confounding factors.**
- **The Jamestown S'Klallam Tribe advocates factoring in salmon consumption when determining the FCR.** As highlighted in the document, salmon (and certain shellfish) are the primary fish species consumed by Washington fish eaters. Salmon consumption in Washington, including by high risk groups, must be a factor if the FCR is to be sufficiently protective of Washington consumers. The Technical Support Document does well to note that experts with

experience in areas of toxicology, risk assessment, public health, biostatistics, and/or epidemiology concluded for Oregon Department of Environmental Quality that Pacific salmon should be included in Oregon's fish consumption rate (p109).

- While the document acknowledges that "tribal populations enjoy treaty fishing rights, and harvesting and eating seafood plays a significant role in their cultures" (p3), the document should better illustrate **that Treaty Tribes have reserved rights to *uncontaminated* fish and shellfish as defined in treaties signed with the United States in the 1850's. While the state has to set protective levels for all fish consumers, tribal treaty rights go beyond that obligation, and this should be an important consideration in determining an FCR.**
- A fish consumption study for the Jamestown S'Klallam Tribe has not been conducted. We recognize that our tribal citizens' actual fish consumption rate may be higher than even the high-end of the range described by the September 2011 Ecology Fish Consumption report, even with the conditions suppressing fish diets. However, in February 2011 the Fish and Game Committee stated that the **Department of Ecology moving forward with a default rate of at least 175g/d is a positive change.** It will be imperative to apply the rate so that it provides meaningful protection (time and acceptable risk and other parameters may be manipulated in the application of the rate but should retain protection for high-risk populations). Ecology must not set a low default rate and claim that the rate may be increased on a site-by-site basis. This will be prohibitively costly in resources, and in personal health of fish consumers.

Again, the Tribe commends the State for finally refining Washington's fish consumption rate to one that is more accurate and more protective of human health when referenced for State Water Quality Standards. Hopefully this will be another step towards improving the condition of these natural resources for tribal and non-tribal citizens in Washington.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott Chitwood". The signature is fluid and cursive, with the first name "Scott" written in a larger, more prominent script than the last name "Chitwood".

Scott Chitwood
Natural Resources Director

January 18, 2012

Ms. Martha Hankins
Washington State Department of Ecology
Toxics Cleanup Program 300 Desmond Drive
Lacey, WA 98503

Re: Comments on Fish Consumption Rates Technical Support Document, Version 1.0

Dear Ms. Hankins:

The Port of Seattle has been involved in sediment cleanups and sediment regulatory efforts since the early 1980s and we appreciate the opportunity to comment on the Fish Consumption Rates Technical Support Document.

While it is good to acknowledge the wide range of seafood consumption levels in Washington, combining this with the specific conservative risk assessment paradigms of the Water Quality and Sediment Management Standards, will not have the intended consequence of greatly decreasing the seafood consumption risk by lowering contaminants in fish and shellfish in the state. It will instead have the unintended consequence of creating a regulatory gridlock that will slow the process of cleanups and stormwater improvements. This is because neither the technology nor the funds are available to address the resulting new lower standards and much of the Puget Sound will become classified as needing cleanup and all of the stormwater along with much of the flowing surface water will be violating the Water Quality standards. The reaction of many parties to this situation will be to put efforts into legal challenges rather than cleanup because they cannot get to resolution through cleanup. We already have, in the existing regulations, standards that can reduce the major part of the controllable risk (risk from recreational and subsistence fishing consumption, that is amenable to change by remediation), so the actual change in protection will be minimal.

The approach needs to take a wider view of the situation, to understand the facts and context surrounding risks from all types food consumption, and to look at all the tools potentially available for modifying regulations to incentivize meaningful actions rather than promote regulatory gridlock.

Some of the things to consider in this wider view are:

The regulations that specify the methods of risk assessment need to be modified to look more specifically at the origin of the risk. For example, how much comes from commercially available sources, what species are being consumed (are they anadromous, obtaining most of their contaminant load from outside the area), how much of the seafood consumed is from the site or area in question (dietary factor).

One in a million risk, for the highest level consumers, is not the basis for acceptable risk in the commercial food industry (an example is the PCB level allowed in fish sold commercially, and the lack of

warning label on every package of high fat red meat). It sets up an unachievable, unreal expectation to have this as the only option in the Model Toxics Control Act applied to the Sediment Management Standards and the Water Quality Standard. It would be better to have a range of acceptable risks in the state regulations, to fit the appropriate situation, much like Federal Superfund.

The estimate of the number of high fish consumers and the consumption rates in this document are very conservative. The surveys used to determine consumption rates are from the highest consuming populations. The number of people included in any of these surveys is quite small, so that the typical metrics used to delineate the upper end of the population (like 90th or 95th percentile) can be actually be defined by very few individuals, especially if they are “outliers” from the rest of the survey population. So when the upper range of the high end consuming populations, is combined with one in a million risk, for several of the most critical contaminants, you have a default to natural background, which is an unachievable standard. In these situations it would be good to have a range of acceptable risk levels in the regulation, so that the higher consumers would be acknowledged, but an achievable solution could be possible.

On a technical note, the number of adults surveyed in the Suquamish tribal survey is described as 92 adults out of 142 potentially eligible tribal adults, in the write-up in section 4, but in the table in that section it is entered as 284. It is 92 in Table C-3, but 284 in tables 1,21,A-1 and C-1. It is my understanding, that the detailed description is correct, this discrepancy should be corrected.

Thank you for the opportunity to comment, and we look forward to the additional review points as this process progresses.

Sincerely,

Douglas A. Hotchkiss
Senior Environmental Program Manager
Port of Seattle



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January 18, 2012

Martha Hankins
Department of Ecology
Toxics Cleanup Program
P.O. Box 47600
Olympia, WA 98504-7600

Becca Conklin
Department of Ecology
Water Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

Re: Comments – Fish Consumption Rates Technical Support Document (draft)

Dear Ms. Hankins and Ms. Conklin:

Thank you for the opportunity to comment on the Draft Fish Consumption Rates Technical Support Document. These comments are being submitted on behalf of TransAlta Centralia Mining LLC (TCM). The comments presented here are general although some specific comments are referenced by page number in the draft document, by chapter section, or both.

Statewide Default Fish Consumption Rate

It seems clear from this document that the Department of Ecology (Ecology) desires to determine a statewide default fish consumption rate. Ecology water quality staff has indicated in the recent public workshops on water quality standard implementation tools, that the default fish consumption rate chosen for sediment management standards will be used as the default for setting statewide water quality standards. However, there is no justification for setting a statewide default rate for fish consumption given in this document particularly with respect to sediment management. In fact, chapters 5 and 6 fully support not having a default rate for sediment management. There is even less basis to support using the same default fish consumption rate for setting water quality standards as for sediment management or toxics cleanup.

TCM believes that it is not appropriate to set a default rate for fish consumption and that each program (MTCA, sediments, water quality, etc.) should set rates appropriate for the intended location or program. There are clearly multiple regions and watersheds in Washington with different fish, different needs, and different populations of fish consumers. At a minimum the Puget Sound, coastal rivers and their tributaries, and the Columbia River and its tributaries

should be treated as separate and distinct ecosystem types with different needs, uses, and fish consumption rate needs. Any recommendation for a statewide default rate should be eliminated from this document and eliminated from consideration by Ecology.

Additionally, it is not appropriate for Ecology to use a guidance document to set a default fish consumption rate. If Ecology believes that there is justification for it to determine a default rate is appropriate, that determination and the setting of the rate must be done through rule making. Currently there is a moratorium on new rulemaking and there is not a justification in the guidance or any other information presented by Ecology for proceeding with new rulemakings to set a default fish consumption rate. Therefore, this process should not proceed as a rulemaking and should not include recommendations for default fish consumption rates that have the effect of a rulemaking.

Executive Summary, Preliminary Recommendation

The first paragraph of this section recommends a “default fish consumption rate in the range of 157 to 267 grams per day”. As described above, TCM believes that it is incorrect to set a “default” fish consumption rate at for Washington State at all and does not support Ecology setting a “default” rate.

The fourth paragraph of this sections states the fish consumption rates should “...reflect state and federal law and policy”. The EPA’s 2000 Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health states in section 1.6 “With AWQC derived for carcinogens based on a linear low-dose extrapolation, the Agency will publish recommended criteria values at a 10^{-6} risk level. States and authorized Tribes can always choose a more stringent risk level, such as 10^{-7} . EPA also believes that criteria based on a 10^{-5} risk level are acceptable for the general population as long as States and authorized Tribes ensure that the risk to more highly exposed subgroups (sportfishers or subsistence fishers) does not exceed the 10^{-4} level.” Ecology seems to have ignored this guidance and chosen to focus completely on subsistence fishers to develop the suggested range of 157 to 267 grams per day and is planning to set fish consumption rates at a level to protect these fishers at or near the 10^{-6} risk level. This is clearly a much higher level of protection than is required by “federal law and policy”.

The EPA’s AWQC guidance clearly uses fish consumption to set a reasonable risk level for different classes of fish consumers. This is significantly different than the Washington MTCA and its requirement for setting a “reasonable maximum exposure” or RME. There are different purposes for the use of a fish consumption rate in these regulations and therefore, different fish consumption rates need to be used for applying these regulations. Ecology must not set a default fish consumption rate to be used for these distinctly different purposes.

The document must include data on fish consumption rates for “the general population” of Washington State. That data is needed to develop rates that provide a 10^{-6} to 10^{-5} for “the general population” and “not exceed the 10^{-4} level” for subsistence fishers. Without this data, the document will not allow Ecology the ability to appropriately evaluate the proper levels to set for fish consumption. To set fish consumption rates higher than those levels will result in more restrictive water quality standards than necessary and will likely result in unachievable standards that are lower than background levels.

Chapter 5, Accounting for Exposure and Fish Diet Fraction in Salmon and Other Anadromous Fish Consumption

The document identifies salmon consumption, fish diet fraction, and the fact that salmon and other anadromous fish obtain little or none of their body burden of contaminants from Washington waters as issues. However, the document proceeds to include salmon in the fish consumption estimates weighted equally with fish that spend their entire lifecycle in Washington waters. In addition to including the salmon consumption in the fish consumption, it appears to be weighted equally with all other fish consumption. At a minimum, this document should evaluate and include data on the portion of body burden of contaminants that anadromous fish obtain from Washington waters, so that an appropriate fish diet fraction can be calculated for these fish. As noted above, these fractions would likely be different for anadromous fish from the Puget Sound, the Columbia River, and from coastal rivers. This data must be included or anadromous fish must be removed from the fish consumption estimates that are used for regulatory purposes.

Chapter 5, Table 26

Table 26 includes information that is out of date and in conflict with information in Table 24.

Please feel free to contact me at (360) 330-8209 or dennis_morr@TransAlta.com if you have any questions related to these comments.

Sincerely,



Dennis N. Morr, Jr.
Sr. Environmental Specialist
TransAlta Centralia Mining LLC

January 17, 2012

fishconsumption@ecy.wa.gov

Toxics Cleanup Program
Washington State Department of Ecology
Olympia, WA



sustainably farmed
oysters, clams, mussels, scallops

Re: Comments on *"Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington"* dated September 2011

Dear Sir or Madam:

Attached please find comments regarding the September 2011 Washington State Department of Ecology (Ecology) report titled *"Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington."* These comments were prepared by ENVIRON on behalf of the Pacific Coast Shellfish Growers Association (PCSGA).

Founded in 1930, PCSGA is based in Olympia, Washington, and represents over 100 shellfish growers in Washington, Alaska, Oregon, California, and Hawaii. Members of PCSGA grow a variety of shellfish including oysters, clams, mussels, and scallops.

Shellfish growers are dedicated to protecting the marine environment. Our communities and our livelihoods are dependent upon the high water quality that has enabled us to farm clean, healthy shellfish here for over 150 years and has helped make Washington the largest producer of farmed shellfish in the nation.

PCSGA commends Ecology for its decision to revise fish consumption rates for Washington residents. Accurate fish consumption rates help protect Washington's shellfish resources. Shellfish and fish caught in the State's waters play a vital role in our environment, culture, and economy, and are important parts of a healthy diet.

We ask that you review and respond to these and all other comments received during this comment period. PCSGA looks forward to further discussions with Ecology regarding the Fish Consumption Rates Technical Support Document, and to continued engagement in this important process.

Respectfully,



Margaret Pilaro Barrette
Executive Director

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January 16, 2012

fishconsumption@ecy.wa.gov

Toxics Cleanup Program
Washington State Department of Ecology
Olympia, WA

Re: Comments on *"Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington"* dated September 2011

Dear Sir or Madam:

This letter provides comments on the draft Washington State Department of Ecology (Ecology) report titled *"Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington"* dated September 2011 (hereafter referred to as the "fish consumption TSD"). These comments were prepared by ENVIRON on behalf of the Pacific Coast Shellfish Growers Association.

We would like to commend Ecology for its timely and comprehensive review of available information and approaches for estimating fish consumption rates for Washington residents. We are blessed with large and diverse sources of marine, estuarine and freshwater fish and shellfish, and fish and shellfish caught in the State's waters play an important role in healthy diets. Protection of this resource is important to all of us.

In the fish consumption TSD, Ecology provides a useful and informative review of fish consumption survey data available for the Pacific Northwest, building on and adapting the analysis done for the Oregon Department of Environmental Quality (2008). We agree that this information helps to characterize fish consumption habits and rates for different State population groups with regard to how much fish is consumed, what kinds of fish are consumed and where the fish is obtained. This information is also likely to be useful in development of site-specific fish consumption rates. However, we question Ecology's conclusion that these data may be used to derive a state-wide default fish consumption rate applicable to a variety of regulatory requirements.

Ecology's notion that one default fish consumption rate can be derived to support a range of regulatory actions does not appear to be scientifically supportable. This is not due to scientific flaws in the fish survey data, but to the narrow focus of many regulations. Each regulation has different goals that are likely to require separate assessments of fish consumption. While a common goal of most regulations is to reduce chemical concentrations in fish, water quality criteria are focused on chemicals in water, while sediment quality standards are focused on contaminated sediments.

Chemicals in fish and shellfish are the result of exposures via diet, water and sediment, with the relative contribution from the various pathways being a function of the kind of fish, individual chemical and type of water body. For example, polycyclic aromatic hydrocarbons (PAHs) may be metabolized in fish, but not in shellfish, resulting in different rates of accumulation in fish vs. shellfish. Biomagnification of mercury results in higher concentrations in higher trophic level fish. Concentrations of arsenic are higher in marine species than in freshwater species,

although most of the arsenic is present in nontoxic, organic forms. These examples illustrate the point that simplistically derived water quality criteria and sediment standards may not yield the expected reductions in chemicals in fish.

Strategies to reduce chemical concentrations might be better focused on relevant fish and shellfish species groups and habitat for each chemical. We recognize that existing regulatory frameworks may not support such an approach, but identification of multiple, carefully defined fish consumption estimates would provide greater flexibility in responding to limits of existing regulations. Some critical issues related to fish consumption definitions are described in the remainder of these comments.

Origin of fish: Distinctions are frequently made between fish caught by anglers vs. fish purchased in stores, between locally sourced fish vs. fish from other areas, and between resident fish and anadromous fish such as salmon. Most regulations are applied to specific water bodies or sites. Logically, applicable fish consumption rates would be limited to fish harvested from the water body or site being regulated. Most regulated chemicals will be present in a variety of food items in addition to fish. Chemicals in fish from other areas are no different conceptually from chemicals in other food items. Thus, consumption of fish from other areas should not be included in the local fish consumption rates, just as consumption of other kinds of foods should not be included. The framework provided by U.S. Environmental Protection Agency (USEPA) Region 10 is a good resource for site-specific approaches (USEPA 2007b).

High consumers: Fish consumption rates should be derived for representative high consumers broken out by fish species groups harvested from the applicable area or water body, such as those derived by The Suquamish Tribe (2000) or Sechena et al. (1999). Available surveys for Washington have demonstrated substantial variation among high consumer groups in terms of fish species groups consumed and locations from which they are harvested. Little information is currently available for high consumer groups in eastern Washington. At a minimum, separate fish consumption rates are needed for freshwater vs. marine and estuarine water bodies, and for resident shellfish vs. finfish.

Long-term average consumption rates: Fish consumption rates for high consumers should be derived from surveys that provide distributions of long-term average rates for each individual rather than from short term dietary surveys such as those presented in USEPA (2002). Upper percentile values from short term surveys can markedly overestimate upper percentiles of long term average rates within populations.

Consumers vs. nonconsumers: Use of long term average consumption rates also mitigates concerns regarding use of data for “consumers only” vs. data for “consumers and non-consumers” combined. Short term surveys will include many “nonconsumers” who may consume fish at other times, but didn’t during the short period of the survey. Surveys that calculate long term averages will include few “nonconsumers” because most people consume some fish or shellfish.

Resident fish vs. anadromous fish: Fish for which chemical concentrations are not affected by the water body or area being regulated should not be included in the fish consumption rate. Salmon and other anadromous fish that do not spend much of their adult life in freshwaters of the state should not be included in fish consumption rates for freshwater bodies. Similarly,

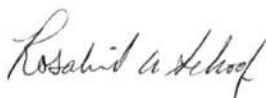
salmon that spend most of their life outside waters of the state should not be included in fish consumption rates for marine and estuarine water bodies.

Suppression vs. increased fish consumption: Ecology raises concerns about consumption rates possibly being suppressed for a variety of reasons (page 96). Some of these reasons are associated with irreversible changes due to development, fluctuation in fish populations and changing cultural preferences. Such changes should not be “corrected” in estimated fish consumption rates. Suppression due to concerns about chemical contamination is unlikely in most marine and estuarine water bodies of the State because most of them are not highly contaminated. Actions taken over the past 40 years have led to substantial improvements in water quality throughout the state. Remedial actions at many contaminated sites have also yielded cleaner sediments in urban areas. In contrast to concerns about suppression, Ecology should describe changing dietary preferences leading to increased fish consumption rates in the general population over the past decade or two.

Chemical uptake into fish: As described above, chemical uptake into fish is a variable function of combined exposures to chemicals in diet, sediment and water. Because Ecology intends to apply fish consumption rates in the context of regulations of chemicals in water and sediment, we recommend that Ecology add a section to the fish consumption TSD describing how the bioaccumulation of chemicals in fish varies by the concentration of the contaminant in water, the type of organism, and the trophic level of the fish species. Historically, water quality criteria have been derived using overly simplistic assumptions that chemical concentrations in surface water can be related to fish concentrations by applying a bioconcentration factor (BCF) with fish consumption rates. As described in USEPA (2007a), bioaccumulation should be represented by a regression equation or some other algorithm rather than a simple constant. Ideally this discussion would come early in the document to provide perspective for the regulatory discussion. Ecology’s discussion of exposure parameters (page 96) should also include some mention of how chemical concentrations in fish are predicted. An understanding of factors controlling chemical uptake into fish is crucial to identification of fish consumption rates that are relevant for the various regulatory contexts in which Ecology will apply them.

In summary, Ecology’s fish consumption TSD provides much useful information to inform the development of fish consumption rates, and acknowledges the multiple regulatory contexts and possible need for multiple fish consumption rates, rather than a single default value. Nevertheless, Ecology proceeds to recommend a range of values from which a single default fish consumption rate would be selected. We do not believe that a single default fish consumption rate can adequately support the varied regulatory needs of the State. Rather, we recommend that Ecology develop a series of rates for, at a minimum, resident marine and estuarine fish, marine and estuarine shellfish, and resident freshwater fish for various high consumer groups.

Sincerely,



Rosalind A. Schoof, PhD, DABT, Fellow ATS
Principal

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Martha Hankins
Toxics Cleanup Program
Washington Department of Ecology
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January 18, 2012

RE: Letter of support for *Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington* (Publication no. 11-09-050)

Dear Ms. Hankins,

I am writing this letter from the following perspective. As professor of toxicology in the Department of Environmental and Occupational Health Sciences at the University of Washington's School of Public Health and the Director of the Pacific Northwest Center for Human Health and Ocean Studies, I am writing to enthusiastically support the Washington State Department of Ecology's *Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington* (Publication no. 11-09-050).

Because I also direct the Institute for Risk Analysis and Risk Communication, my comments support the Department of Ecology's use of established and well recognized risk assessment approaches. The increase in fish consumption is well documented with Pacific Northwest relevant references. In addition to the points that I covered in my presentation titled "What's the Public Health Issue, and Why Is It Important?" at the Department of Ecology's Fish Consumption Rate Workshop held December 12, 2011 at the University of Washington, there are even more recent recommendations by the *Dietary Guidelines for Americans, 2010* that further promote increased levels of fish into healthy diets. For example, they recommend Americans "Increase the amount and variety of seafood consumed by choosing seafood in place of some meat and poultry." The dietary guidelines further recommend for women who are pregnant or breastfeeding to consume seafood each week from a variety of seafood types. These recommendations emphasize the importance of fish consumption, and, taken together with actual fish ingestion levels in the Pacific Northwest, point to the need for the scientifically-based documentation provided by the Department of Ecology's *Fish Consumption Rates Technical Support Document*.

I am highly supportive of the effort undertaken to recognize that fish ingestion is much greater than previously acknowledged. I am likewise highly supportive of the philosophy behind this report and the quantification methods employed. Having been knowledgeable in this topic and the scientific and technical aspects involved, I can say that this report represents a robust, scientific-based assessment that is both clear and transparent. This

report provides an invaluable contribution and major step forward in the protection and preservation of fish and shellfish resources for the people of Washington State.

A handwritten signature in black ink, reading "Elaine M. Faustman". The signature is fluid and cursive, with a long horizontal stroke at the end.

Elaine M. Faustman, Ph.D. DABT
Professor and Director
Institute for Risk Analysis and Risk Communication
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January 18, 2012

Ted Sturdevant, Director
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-47600

Dear Director Sturdevant:

This letter is in response to the Department of Ecology's request for comments on its *Fish Consumption Rates Technical Support Document* (TSD). The Association of Washington Business (AWB) appreciates the opportunity to review and provide comments on the TSD.

As you know, Washington uses fish consumption rates as a basis for environmental cleanup and pollution control. The current rates, 6.5 grams per day (in water quality standards) and 54 grams per day (in the Model Toxics Control Act regulation), provide default values used in setting regulatory standards. Under the TSD, the Department of Ecology (Department) contends that the preliminary analysis shows that data about fish consumption in the Pacific Northwest supports the use of default fish consumption rates between 157-267 grams per day.

The Department's decision to review and update fish consumption rates for Washington residents is a decision that will result in significant policy and regulatory implications. Ultimately, a new fish consumption rate (FCR) will be used in updates to Sediment Management Standards (WAC 173-204), Surface Water Quality Standards (WAC 173-201A), and the Model Toxics Control Act (WAC 173-340). The Department should establish and implement human health-based regulatory requirements that are protective for Washington citizens while taking the time necessary to develop regulatory requirements that are both meaningful and achievable.

As the Department prepares to amend both sediment management standards and surface water quality standards, the Department must comply with all of the

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requirements of RCW 34.05.328 (significant legislative rule evaluation). An analysis under RCW 34.05.328 requires the Department, among other things, to consider alternatives to rule making, and the costs and benefits of implementation. This analysis can be used to educate the Department, the public, and the Legislature on both the science and policy choices used by the Department to update these regulations. The Department's analysis under RCW 34.05.328 should fully evaluate the policy decisions and their effects on Washington's citizens, the Department, and the regulated community.

While the AWB has not submitted comments of a scientific/technical nature, we suspect that many of the comments received by the Department on the TSD will be of a technical nature and raise questions as to the science and risk management policy used by the Department in developing a proposed FCR range of 157-267 grams per day. We respectfully request the Department to respond in writing to the substantive science/technical and risk management issues that are raised in the comments to the TSD prior to moving forward on any related rule-making activities.

Sound environmental policy requires integrated risk assessment strategies that draw on a range of disciplines, including science, technology, economics, and public policy. Actions taken by the Department to update the FCR and water quality criteria and sediment management standards should be based on credible science and avoid absurd results. Selecting a FCR that yields human health-based water quality criteria or sediment management standards to levels below natural background concentrations creates uncertainty for the regulated community to achieve compliance.

The Department should continue to explore strategies and regulatory mechanisms that allow wastewater discharges and potentially liable parties to comply in good faith with the Clean Water Act. The AWB supports the Department's decision to pursue its water quality "implementation tools" prior to updating human health-based water quality criteria. These tools and other compliance mechanisms must be in place before adopting more stringent water quality criteria, if the updated criteria are to have any meaningful impact on water quality in Washington.

As rule making proceeds, the Department should be thoughtful in how it communicates the current risk, if any, to public health and the public health benefits derived in updating the FCR and related environmental regulations. This information is necessary to provide a context for any revision to water quality criteria and also protect against misinformation about the current risks of consuming fish or shellfish.

We thank you for the opportunity to submit comments on the TSD for your consideration. The AWB will continue to closely monitor the efforts of the Department in updating the FCR and related regulations. We appreciate your thoughtful consideration of all the comments received on the TSD.

Sincerely,



Gary Chandler
Vice President of Government Affairs

From: [Alexandra Smith](#)
To: [ECY RE Fish Consumption](#)
Subject: Comments on Fish Consumption Rates
Date: Wednesday, January 18, 2012 1:40:10 PM

Ecology:

Thank you for the opportunity to comment on the fish consumption rate technical document Ecology has developed. I would like to make 3 points as Ecology moves forward to adopting a default fish consumption rate for the Sediment Management Standards and potentially for the water quality program:

1. We believe the default rate should be calculated using fish that actually take on and/or bioaccumulate chemical constituents in Washington waters. In particular, salmon make up the overwhelming portion of the fish consumed in the Pacific Northwest, yet studies have shown that salmon accumulate almost all of their body burden of bioaccumulative contaminants such as PCBs and dioxins/furans while they are at sea. Therefore, any change in Washington's regulations will not change what bioaccumulates in salmon and similarly what salmon consumers are exposed to. We believe it is more appropriate to calculate a default fish consumption rate for Washington using fish and shellfish actually impacted by the quality of Washington sediments and waters: specifically shellfish and non-migratory finfish species.
2. We also ask that Ecology maintain the current fish diet fraction of .5. Given the wide range of sources (including supermarkets and imported fish) that we all use to obtain fish and shellfish for consumption, we think it is not accurate to assume that an individual would obtain 100 percent of his or her diet of these species from a single, small geographic area, except for the most vulnerable populations who rely on subsistence fishing in a specific area. However, given that the number Ecology will be adopting is a default number applicable to all Washington citizens in all situations, we ask that Ecology not adopt a fish diet fraction that only represents one part of Washington's diverse fish eating population.
3. We have a similar concern in what appears to be the de-coupling of the fish consumption rate from the applicable risk range. In the past, EPA and Ecology have chosen a consumption rate that the general public as a whole would not often exceed, but then used a very protective risk level (10-6). The risk level protects high consumers, despite the fact that the consumption rate reflects the more general population. It appears Ecology has de-coupled the risk range from the consumption rate, and instead decided to adopt both a risk range and a fish consumption rate geared to protect the highest fish consumers. The original 10-6 decision on water quality standards was made with more of a general population level consumption rate, and a recognition that the smaller percentage of the population that consumes at much higher levels will be protected by the more stringent risk range. If Ecology independently changes the consumption rate without also re-visiting the risk level/risk range, we could well end up with the very stringent and ultimately unattainable standards that some fear could come out of this process. In the context of the water quality program, it is particularly concerning if unachievable standards are adopted, as the Clean Water Act's citizen suit provisions expose parties who are doing all they can to meet the unachievable standards to potentially costly law suits.

Again, we appreciate Ecology's work on this and appreciate the opportunity to

comment.

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January 18, 2012

Washington Department of Ecology
Toxics Cleanup Group
fishconsumption@ecy.wa.gov

Via Email

RE: Ecology's Draft Fish Consumption Rates Technical Support Document.

Dear Department of Ecology:

Columbia Riverkeeper, Spokane Riverkeeper, the Puget Soundkeeper Alliance, and North Sound Baykeeper (collectively "Washington Waterkeepers") submit the following comments on Washington Department of Ecology's ("Ecology") draft *Fish Consumption Rates Technical Support Document: A Review of Data and Information About Fish Consumption in Washington* ("Report"). The Report is a critical first step toward adopting Sediment Management Standards, Water Quality Standards, and MTCA Cleanup Standards that accurately reflect fish consumption rates in Washington State and protect public health.

At the outset, the Washington Waterkeepers commends the work of Ecology's Toxics Cleanup Group and the many individuals who helped contribute to this exhaustive document. Analyzing fish consumption rates across Washington State and developing an accurate, protective fish consumption rate is no small feat. The Washington Waterkeepers appreciate the time and dedication of Ecology's staff and the other individuals in the private and public sectors who helped contribute to this important review of fish consumption rates in Washington State.

The cultural, health, and economic benefits of the state's aquatic resources cannot be overstated. Puget Sound, the Columbia River, the Spokane River, and countless other waterbodies across the state provide healthy sources of food for individuals and families from all walks of life. Yet toxic pollution has resulted in dozens of fish advisories and led many individuals to curtail their consumption of fish and shellfish. Despite this fact, Washington has relied on one of the nation's lowest fish consumption rates—6.5 grams per day—for nearly two decades. By using a low fish consumption rate, Washington's regulations which are intended to protect public health and aquatic resources fail to achieve these objectives.

The Report is an important step toward rectifying the state's low fish consumption rate. The Report, however, will not result in any immediate changes to Washington's Sediment Management Standards, Water Quality Standards, or MTCA Cleanup Standards. In fact, the in-water benefits that can stem from this Report require a steadfast commitment by Ecology and decisionmakers across Washington State to restore healthy, toxics-free fish and shellfish by

adopting new Sediment Management Standards, Human Health Criteria Water Quality Standards, and MTCA Cleanup Standards that reflect the Report's findings.

I. Specific Comments on Technical Report.

A. Ecology Should Adopt Site Specific Fish Consumption Rates Only Where those Rates Would be More Protective than the Default Rate.

The Washington Waterkeepers support Ecology's policy decision that the default fish consumption rate should be protective of all people in Washington who eat fish, including those individuals that eat a lot of fish, such as Native Americans, Asian and Pacific Islanders, and some recreational fishers. *See* Report at 92. The Report, however, would benefit from additional clarification on when Ecology would allow the use of a site specific fish consumption rate. *See generally* Report, Ch. 6 at 92 – 100. Like Ecology's decision to adopt a default rate that is protective of "all people in Washington who eat fish," the Washington Waterkeepers urge Ecology to adopt a policy of restricting the use of site specific fish consumption rates to scenarios where the site specific rate would be more protective than the default rate.

The Report states that "[a] site-specific fish consumption rate may be needed when default exposure parameters do not adequately protect the fish-consuming population in question." Report at 92. The Washington Waterkeepers agree that this is an appropriate circumstance for adopting a site specific rate. The Report does not, however, address the question of whether a site specific rate could be used when a third-party asks Ecology to evaluate whether the default rate is *too* protective of a specific area (*i.e.*, a survey or other information indicates a lower fish consumption rate than the state-wide default rate). Due to the inherent challenges of accounting for suppression effects, the Washington Waterkeepers urge Ecology to revise the Report to clarify that site specific rates are only appropriate for the purposes of protecting populations where the default rate is under protective.

Specifically, the Report acknowledges the impact of "suppression effects" when calculating the fish consumption rate. *See* Report at 96. "Suppression effects" refer to suppressed fish consumption rates due to a variety of reasons including habitat degradation, fish and shellfish contamination, lower fish and shellfish abundance, and fewer numbers of Native Americans practicing subsistent or traditional lifestyles. *Id.*; *see also id.* at 107 ("Studies indicate that tribal fish consumption rates are suppressed compared with historical rates and presumable rates that would exist given historical fishing stocks."). Given the impact of suppression effects on fish consumption rates, along with the challenge of extrapolating the actual effect, Ecology should restrict the use of site specific rates to circumstances where the rate would be more protective than the default rate.

B. Ecology Should Account for Salmon and Steelhead Consumption When Calculating the Default Fish Consumption Rate.

The Report currently includes salmon consumption in its recommended fish consumption rate. Ecology discusses this issue at length and requests input from stakeholders on this decision. The Washington Waterkeepers urge Ecology to retain salmon consumption in the final Report's recommendation because studies demonstrate that salmon are exposed to and impacted by bioaccumulative toxins during life stages spent in state-regulated waters.

Appendix E to the Report, “The Question of Salmon,” discusses at length salmon in Puget Sound. As the Report notes, Puget Sound is home to resident salmon that spend a portion of their juvenile life and their entire saltwater life in Puget Sound. Puget Sound resident Chinook Salmon currently have a Department of Health fish consumption advisory due to PCBs, suggesting that people should not eat more than two (2) meals a month. A 12-pound fish would thus take a person one (1) year to eat according to this advisory. Ocean migrating Chinook caught in Puget Sound have a similar warning, but recommend limiting consumption to four (4) meals a month. Given the current impact of toxic pollution on Puget Sound salmon, Ecology should not treat the inherent challenge of attributing salmon contaminant body burdens to site-specific contaminants as a barrier to including salmon consumption in the fish consumption rate.

Ecology should also include salmon in the fish consumption rate based on studies demonstrating that juvenile salmon are exposed to toxic pollution in the Columbia River. The Washington Waterkeepers recommend that Ecology expand Appendix E to address Columbia River studies, rather than restricting “The Question of Salmon” to studies on Puget Sound. For example, the Columbia River Intertribal Fish Commission’s comments state:

Recent studies demonstrate that salmon receive a significant percentage of their body contaminant burden from the freshwater portion of their life cycle through contact with contaminated sediments and ingestion of contaminated food sources. (NOAA, 2009, Data Report for Lower Columbia Juvenile Salmon Persistent Organic Pollutant Exposure Assessment, prepared by the Environmental Conservation Division, Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, for the NOAA Damage Assessment Center and Portland Harbor Natural Resource Trustees; and Sloan, C.A., et. al, 2010, Polybrominated Diphenyl Ethers in Outmigrant Juvenile Chinook Salmon from the Lower Columbia River and Estuary and Puget Sound, Washington, Arch. Contam. Toxicol, (2010), 58:403-414.) Ecology should consider these findings when reviewing the discussion contained in Appendix E – *The Question of Salmon*.

Letter from CRITFC to Ecology (Dec. 20, 2011).

In addition, other studies on toxics in salmon conducted in the lower Columbia River demonstrate that PCBs and DDTs are accumulating in the bodies of outmigrating juvenile salmon. For example, a study published in 2007 showed that almost one-third of juvenile salmon had PCB concentrations that exceeded threshold levels for adverse health effects such as metabolic alterations, reduced growth immune dysfunction, and reduced long-term survival. Johnson, L.L. *et al.* 2007a. Persistent Organic Pollutants in Outmigrant Juvenile Chinook Salmon from the Lower Columbia Estuary, USA. *Science of the Total Environment*, 374: 342-366; *see also* Meador et al. 2002. Use of Tissue and Sediment-Based Threshold Concentrations of Polychlorinated Biphenyls (PCBs) to Protect Juvenile Salmonids Listed Under the U.S. Endangered Species Act. *Aquatic Conservation: Marine and Freshwater Ecology*, 12: 493-516. Other studies found amounts of DDT in some juvenile salmonid bodies at levels that could contribute to disruption of the endocrine and immune systems. Beckvar *et al.* 2005. Approaches

for linking Whole-Body Fish Residues of Mercury or DDT to Biological Effects Thresholds. *Environmental Toxicology and Chemistry*, 24: 2094-2105.

The findings of the *Lower Columbia River and Estuary Monitoring: Water Quality and Salmon Sampling Report* (“LCREP study”) also support including salmon when calculating the fish consumption rate. The LCREP study explains:

A salmon fry hatches with toxic contamination in its body from the fats and proteins it inherits from its mother, who deposits toxics during egg production. As the young salmon maneuvers and feeds, it takes in additional toxics in several ways: from the water that passes over its skin and through its gills, from bed sediment it ingests as it pursues bottom-dwelling prey, and from suspended sediment it swallows during feeding. The aquatic and terrestrial insects it eats also contain toxics, which then are absorbed in the fish’s body.

Lower Columbia River Estuary Partnership. 2007. *Lower Columbia River and Estuary Ecosystem Monitoring: Water Quality and Salmon Sampling Report* at 18. The LCREP study also discusses exposure profiles of salmon populations, stating:

Because toxic contaminants are unevenly distributed and different salmon populations use different habitats, the types and levels of toxics that juvenile salmon are exposed to in the lower Columbia River and estuary vary from one population to the next. Ocean-type juveniles rear in the lower river for weeks or months during the first year of life. They take refuge and forage in side channels, shallow marshes, and swamps—**the very areas where bioaccumulative toxics can build up if contaminant sources are present.**

Id. at 19 (emphasis added). The LCREP study further explains:

Given the habitat use and relatively long estuarine residence time of ocean-type juveniles, their contaminant exposure profiles tend to reflect toxics present in the habitat and prey species of the lower river. These toxics include both water-soluble toxics, such as pesticides currently being used, and bioaccumulative toxics, such as PCBs and DDT. Thus ocean-type juveniles experience both short-term and bioaccumulative toxicity.

Id. In short, toxics present in the lower Columbia River account for toxics found in salmon during later life stages.

The impacts of toxics from the Columbia River is not limited to ocean-type juvenile salmonids. The LCREP study explains that stream-type juveniles, which spend most of their first year in freshwater tributaries, are also impacted by toxic pollution in the estuary and freshwater environment. The study states:

When they [*i.e.*, the stream-type juveniles] do migrate downstream, they move through the estuary more quickly than ocean-types do, using deeper water habitats and spending more time in the plume waters. Consequently, the exposure profile of stream types is

more likely to reflect toxics in upstream tributaries and the water-soluble toxics in the river's deeper channels.

Id. at 19. After conducting monthly juvenile salmon sampling at multiple points along the lower Columbia River, the LCREP study found the following toxic pollutants in juvenile salmon: PCBs, PAHs, Organochlorine, pesticides, PBDEs, and vitellogenin. In particular, the LCREP study detected PCBs, PAHs, DDTs and PBDEs in both the bodies and stomach contents of juvenile salmon, including that prey are a source of exposure to these bioaccumulative toxics. *Id.* at 43. Notably, the LCREP study found that “[t]he highest concentrations of PCBs, PAHs, and PBDEs were observed in salmon from sites near the more industrialized areas of the Columbia River: lower Willamette River, confluence of the Columbia and Willamette rivers, Columbia City, and Beaver Army Terminal. *Id.* In short, the findings of the LCREP study support Ecology’s decision to include salmon when calculating the fish consumption rate.

Based on the recorded impacts of toxins on salmon during juvenile life stages, the Washington Waterkeepers urge Ecology to reconsider and omit the following statement in the draft Report: “Washington regulations may have little effect on salmon contaminant levels.” Report at 5 (stating in full “However, most salmon leave Washington waters when they are a couple of inches long, spend years in the open ocean, and return to Washington waters at the end of their life cycle. Consequently, contaminants in salmon predominantly come from food they eat while at sea. Thus, Washington regulations may have little effect on salmon contaminant levels.”).

Aside from studies demonstrating that toxic pollution impacts salmon during life stages spent in Washington-regulated waterbodies, many Washington waterbodies, including the Columbia River and Puget Sound, influence marine toxic loading. In turn, Ecology should: (1) retain the draft Report’s decision to include salmon consumption when calculating the recommended fish consumption rate, (2) expand Appendix E to address Columbia River studies, and (3) omit statements, such as the one identified above, which are not supported by scientific literature demonstrating that toxic pollution in Washington waterbodies impacts salmon.

C. The Washington Waterkeepers Support a Fish Consumption Rate which Protects the Vast Majority of People who Eat Washington-caught Fish.

As the Report accurately points out, Washington’s current fish consumption rate fails to protect many Washingtonians, particularly tribal members, Asian and Pacific Islanders, recreational fishers, and others. The Report examines studies which overwhelmingly demonstrate that many Washingtonians eat significantly more fish than the current toxics standards assume. Based on these studies, the Report concludes that a default fish consumption rate in the range of 157 to 267 grams per day (g/day) would be appropriate. The Report also acknowledges that the range of the recommended fish consumption rate does not capture the state’s highest fish consumers.

The Washington Waterkeepers support adopting a fish consumption rate that protects the vast majority of people who regularly eat Washington-caught fish which is reflected by the upper

range of the Report's recommended fish consumption rate. The Washington Waterkeepers also agree with the comments of the Northwest Indian Fisheries Commission ("NWIFC"): at a minimum, the fish consumption rate should be no lower than the 175 g/day rate adopted by Oregon's Environmental Quality Commission. The Washington Waterkeepers also agree with the NWIFC comment that the lower range of the recommended fish consumption rate does not fully account for fish consumption rates of Columbia River tribes. Overall, the Washington Waterkeepers agree with the Report's finding that a fish consumption rate dramatically higher than the current rate of 6.5 g/day and EPA's recommended rate of 17.5 g/day is necessary.

II. Conclusion.

The Washington Waterkeepers support Ecology's effort to adopt a new, accurate fish consumption rate. While this endeavor is long overdue, the Report is a critical first step toward addressing major flaws in the current standards which incorrectly assume that Washingtonians eat 6.5 grams of fish per day. We urge Ecology to continue and begin the necessary rulemakings to incorporate the higher fish standard into the Sediment Management Standards, Water Quality Standards, and MTCA Cleanup Standards. Thank you in advance for considering these comments.

Sincerely,

Brett VandenHeuvel
Executive Director
Columbia Riverkeeper

Bart Mihailovich
Spokane Riverkeeper

Chris Wilke
Puget Soundkeeper and Executive Director
Puget Soundkeeper Alliance

Matt Krogh
North Sound Baykeeper

cc:

Jannine Jennings, EPA, Region X
Mary Lou Soscia, EPA, Region X
Aja DeCoteau, Columbia River Intertribal Fish Commission
Dianne Barton, Columbia River Intertribal Fish Commission
Fran Wilshusen, Northwest Indian Fisheries Commission
Ann Seiter, Northwest Indian Fisheries Commission



*Northwest
Environmental
Advocates*

January 18, 2012

Ted Sturdevant, Director
Martha Hankins
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600
Via email: fishconsumption@ecy.wa.gov

RE: Draft Fish Consumption Rates Technical Support Document: A Review of Data and Information about Fish Consumption in Washington

Dear Director Sturdevant and Ms. Hankins,

Thank you for the opportunity to provide comments on the *Fish Consumption Rates Technical Support Document: A Review of Data and Information about Fish Consumption in Washington (Publication no. 11-09-050, dated September 2011.*

People for Puget Sound is a nonprofit, citizens' organization whose mission is to protect and restore the health of Puget Sound and the Northwest Straits. Northwest Environmental Advocates was established in 1969 to protect and restore water quality, wetlands, and wildlife habitat in the Pacific Northwest.

Fish are an essential component of healthy diet and, in addition, they play an important cultural role. Unfortunately, PCBs (polychlorinated biphenyls), dioxins, mercury, and other persistent chemicals can accumulate in fish tissue and so it is important that the correct (default) fish consumption rates are used in water and sediment cleanup standard determinations (Washington Administrative Code (WAC) 173-204, 173-201A, 173-340 parts of which are being updated by Ecology in the next year)). A significant number of Washington residents likely consume fish and shellfish at rates higher than the rates used in current regulations.

Current regulations are:

- The MTCA Cleanup Regulation have a default fish consumption rate of 54 grams (1.9 ounces) per day, established in 1991 and based on a survey of Washington recreational anglers in Commencement Bay.

- The Water Quality Standards for Surface Waters reference the National Toxics Rule, which includes water quality standards for human health protection based on a fish consumption rate of 6.5 grams (0.22 ounces) per day. This value is based on technical evaluations completed by the U.S. Environmental Protection Agency in the mid-1980s.

Oregon recently adopted standards of 175 grams per day.

Our comments follow:

- **Report overall.** Overall, the report is excellent. We appreciate the level of technical detail and the clarity of the report. We generally agree with the conclusions.
- **An update must occur.** Currently, the default rates in place do not protect either the general population or the high user groups. This is contrary to both state and federal law that standards must adequately protect human health. For this reason, we urge a speedy process to update the default fish consumption rates for both sediment and water quality standards. Further, we strongly recommend that Ecology bundle the fish consumption/human health criteria rulemaking with the “implementation tools” rulemaking rather than loosening regulatory controls prior to adopting appropriate fish consumption rate-based criteria.
- **Rate.** Based on the technical assessment, Ecology has concluded that available scientific studies support the use of a default fish consumption rate in the range of 157 to 267 grams per day (g/day). We support a rate that is at least this high. Fish consumption rates should seek to protect no less than the 90 percentile of any affected population. As has been pointed out in comment letters to you from tribes, the fish consumption rates proposed by Ecology are not high enough to provide adequate protection for all tribes, some of whom will likely set their own standards. We also support the inclusion of salmon in the rate as was done by Oregon because contaminants in salmon contribute to the human health risks experienced by Washington fish consumers.
- **Range versus single number.** We are concerned that Ecology will seek to promulgate a range of rates rather than a single minimum default rate. A range of rates will end up with legal challenges and extended fights for each cleanup or permit. We support a single minimum default rate, not a range of rates.
- **Number of fish consumers.** The low end number of general population consumers is based on EPA’s national information. This does not seem to reflect the Washington population well, as shown by the DOH survey. We believe that the number used should be the DOH number with a statistical range associated with that number rather than a range using the EPA number as the low end of the range.
- **Subsistence fishers.** The lack of studies of subsistence fish consumption rates is disappointing. The rates being considered by Ecology, therefore, exclude this population which historically has been ignored.
- **Suppression effects.** Similarly, suppression effects are not being incorporated. Reduction of habitat, toxic contamination, loss of access, and other factors have artificially reduced consumption. We believe that suppression effects should be included.
- **Fish consumption surveys.** We support the use of tribal and community fish consumptions surveys including the 1994 Umatilla, Nez Perce, Yakama, and Warm Springs Tribes survey, the 1996 Tulalip and Squaxin Island Tribes survey, the 2000 Suquamish Indian Tribe of the Port Madison Indian Reservations,

Puget Sound Region and the 1994 Asian and Pacific Islander Study. It would be preferable that there would be even more studies conducted and especially those done by the tribes themselves to ensure that in the future Washington's fish consumption assumptions reflect the real health risks posed by fish consumption. We do not suggest that Ecology should postpone a timely resolution to a long overdue revision to Washington's standards but, rather, that Ecology not see this needed step as necessarily resolving the issue.

Thank you for your consideration. You can reach Heather at (206) 382-7007 (X172)/htrim@pugetsound.org or Nina at (503) 295-0490/nbell@advocates-nwea.org.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Heather Trim', with a stylized flourish at the end.

Heather Trim
Director of Policy
People For Puget Sound

A handwritten signature in dark ink, appearing to read 'Nina Bell', with a stylized flourish at the end.

Nina Bell
Executive Director
Northwest Environmental Advocates



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January 18, 2012

Martha Hankins
Department of Ecology
Toxics Cleanup Program
P.O. Box 47600
Olympia, WA 98504-7600

Becca Conklin
Department of Ecology
Water Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

Dear Ms. Hankins and Ms. Conklin:

Thank you for the opportunity to comment on the Draft Fish Consumption Rates Technical Support Document. These comments are being submitted on behalf of TransAlta Centralia Generation LLC. The comments presented here are general although some specific comments are referenced by page number in the draft document, by chapter section, or both.

Statewide Default Fish Consumption Rate

It seems clear from this document that the Department of Ecology desires to determine a statewide default fish consumption rate. Ecology water quality staff has indicated in the recent public workshops on water quality standard implementation tools, that the default fish consumption rate chosen for sediment management standards will be used as the default for setting statewide water quality standards. However, there is no justification for setting a statewide default rate for fish consumption given in this document particularly with respect to sediment management. In fact, chapters 5 and 6 fully support not having a default rate for sediment management. There is even less basis to support using the same default fish consumption rate for setting water quality standards as for sediment management or toxics cleanup.

Ecology must not set a default statewide fish consumption rate that will be used by multiple programs. Each program (MTCA, sediments, water quality, etc.) should set rates appropriate for the intended location or intended needs of the program. There are clearly multiple regions and watersheds in Washington with different fish, different needs, and different populations of fish consumers. At a

minimum the Puget Sound, coastal rivers and their tributaries, and the Columbia River and its tributaries should be treated as separate and distinct ecosystem types with different needs, uses, and fish consumption rate needs. Any recommendation for a statewide default rate should be eliminated from this document and eliminated from consideration by the Department of Ecology.

Additionally, it is not appropriate for Ecology to use a guidance document to set a default fish consumption rate. If Ecology believes that there is justification for it to determine a default rate is appropriate, that determination and the setting of the rate must be done through rule making. Currently there is a moratorium on new rulemaking and there is not a justification in the guidance or any other information presented by Ecology for proceeding with new rulemakings to set a default fish consumption rate. Therefore, this process should not proceed as a rulemaking and should not include recommendations for default fish consumption rates that have the effect of a rulemaking.

Executive Summary, Preliminary Recommendation

The first paragraph of this section recommends a “default fish consumption rated in the range of 157 to 267 grams per day”. As described above, TransAlta believes that it is incorrect to set a “default” fish consumption rate at for Washington State at all and does not support Ecology setting a “default” rate.

The fourth paragraph of this sections states the fish consumption rates should “...reflect state and federal law and policy”. The EPA’s 2000 Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health states in section 1.6 “With AWQC derived for carcinogens based on a linear low-dose extrapolation, the Agency will publish recommended criteria values at a 10^{-6} risk level. States and authorized Tribes can always choose a more stringent risk level, such as 10^{-7} . EPA also believes that criteria based on a 10^{-5} risk level are acceptable for the general population as long as States and authorized Tribes ensure that the risk to more highly exposed subgroups (sportfishers or subsistence fishers) does not exceed the 10^{-4} level.” The Department of Ecology seems to have ignored this guidance and chosen to focus completely on subsistence fishers to develop the suggested range of 157 to 267 grams per day and is planning to set fish consumption rates at a level to protect these fishers at or near the 10^{-6} risk level. This is clearly a much higher level of protection than is required by “federal law and policy”.

The EPA’s AWQC guidance clearly uses fish consumption to set a reasonable risk level for different classes of fish consumers. This is significantly different than the Washington MTCA and its requirement for setting a “reasonable maximum exposure” or RME. There are different purposes for the use of a fish consumption rate in these regulations and therefore, different fish consumption rates need to be used for applying these regulations. Ecology must not set one statewide default fish consumption rate to be used for these distinctly different purposes.

The document must include data on fish consumption rates for “the general population” of Washington State. That data is needed to develop rates that provide a 10^{-6} to 10^{-5} for “the general population” and “not exceed the 10^{-4} level” for subsistence fishers. Without this data, the document will not allow Ecology the ability to appropriately evaluate the proper levels to set for fish consumption. To set fish consumption rates higher than those levels will result in more restrictive

water quality standards than necessary and will likely result in unachievable standards for many contaminants, including metals like arsenic, that are lower than background levels.

Chapter 5, Accounting for Exposure and Fish Diet Fraction in Salmon and Other Anadromous Fish Consumption

The document identifies salmon consumption, fish diet fraction, and the fact that salmon and other anadromous fish obtain little or none of their body burden of contaminants from Washington waters as issues. However, the document proceeds to include salmon in the fish consumption estimates weighted equally with fish that spend their entire lifecycle in Washington waters. In addition to including the salmon consumption in the fish consumption, it appears to be weighted equally with all other fish consumption. At a minimum, this document should evaluate and include data on the portion of body burden of contaminants that anadromous fish obtain from Washington waters, so that an appropriate fish diet fraction can be calculated for these fish. As noted above, these fractions would likely be different for anadromous fish from the Puget Sound, the Columbia River, and from coastal rivers. This data must be included to account for only contaminants from Washington waters or anadromous fish must be removed from the fish consumption estimates that are used for regulatory purposes.

Additionally, there is no determination and little discussion of where the consumed fish are obtained. This data must be included in the document as the general population of Washington State is unlikely to obtain the majority of the fish that it consumes directly from Washington waters. The fish consumption rates must remove any consumption of fish where the contaminants in those fish are not directly attributable to Washington waters. To include that fish consumption in the rates used for regulation of Washington waters would increase stringency of Washington water quality standards while providing no reduction in risk for Washington residents.

Chapter 5, Table 26

Table 26 includes information that is out of date and in conflict with information in Table 24.

Please feel free to contact me at (360) 807-8031 or brian_brazil@TransAlta.com if you have any questions related to these comments.

Sincerely,



Brian Brazil
Environmental Manager
TransAlta Centralia Generation



Environmental Program

Fisheries Department

360/394-8450

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THE SUQUAMISH TRIBE

P.O. Box 498 Suquamish, Washington 98392

January 18, 2012

Washington State Department of Ecology
Toxics Cleanup Program/Water Quality Program
fishconsumption@ecy.wa.gov

RE: (Draft) Fish Consumption Rates Technical Support Document
September, 2011
Publication Number 11-09-050

Thank you for providing the Suquamish Tribe (the Tribe) the opportunity to review the draft Fish Consumption Rates Technical Support Document (referred to as the "FCR document" in this letter). The Tribe recognizes the effort of Ecology to consider tribal concerns in the process of updating state environmental regulations and policies to be protective of all the people of Washington. The following comments are provided to assist Ecology in this effort.

The Need to Revise the Fish Consumption Rate (FCR)

The Suquamish Tribe agrees that the current fcr should be revised to reflect data demonstrating that a significant number of Washington residents consume fish and shellfish at higher rates than those currently used for regulatory purposes. Failure to act on this issue subjects all Washington residents to potentially increased risks associated with contaminated fish and shellfish and is not consistent with Ecology's mission to protect, preserve and enhance Washington's environment and promote the wise management of our air, land and water for the benefit of current and future generations.

Ecology Proposed FCR Range

Ecology is recommending the use of default fish consumption rates in the range of 150-275 grams per day (gpd), based on evaluation of recent consumption surveys and departmental choices regarding risk management.

The Suquamish Tribe agrees that the proposed range represents a more protective approach for Washington residents in general. The Tribe notes that the highest value in the proposed range will be protective of Suquamish tribal members at less than the 75% fcr (284 gpd) documented in the Suquamish survey. For Suquamish tribal members, this is not consistent with reasonable maximum exposure (RME) scenarios based on 90-95th percentile population distributions.

The Tribe also notes that the proposed range encompasses the 90th percentile of the estimated national per capita fish consumption rate for adults (250 gpd), which is used in the FCR document to define “high fish consumers”. The FCR document, however, offers seemingly contradictory statements regarding whether this is an appropriate reference for Washington State:

Page 25: “It is reasonable to assume that the dietary habits and patterns for Washington fish consumers are similar to those reported for the U.S. fish consumers.”

Page 26: “Moya (2004) reports that people living in coastal states tend to consume fish and shellfish at a higher frequency and at higher rates than people living in inland states. This suggests that the distribution of fish consumption rates (including the 90th percentile value) may be higher in Washington than a distribution based on national survey statistics.”

Please clarify the definition of “high fish consumers” in Washington.

Suquamish Consumption Survey

Please correct the summary survey results for Suquamish adult fish consumers presented in tables throughout the FCR document and cite the Suquamish survey as the source:

Number of adults surveyed = 92

75th percentile rate = 284 gpd

95th percentile rate = 797 gpd

On page 65, Table 20, correct the description of the Suquamish survey to indicate that it pertains to Suquamish tribal members.

Consideration of Salmon

In the FCR document, Ecology raises the question of whether salmon should be included in the total fcr considering the life cycles and biology of different salmon species.

As stated in the Suquamish survey, “The Suquamish culture finds its fullest expression in the acknowledged relationship of the people with the land, air, water and all forms of life found within the natural system.” The importance of salmon to tribal members is further established with 92 percent of survey respondents reporting that they eat salmon at ceremonies, gatherings and community events throughout the year. The Suquamish survey reports a 95th percentile consumption rate for salmon (Group A) of 172 gpd.

Given the cultural significance of salmon to Northwest tribes, and considering tribal treaty-reserved rights to safely access and harvest resources, Ecology’s regulatory decisions and policies should protect tribal members who consume salmon, as well as prevent degradation of water quality and fish habitat essential to salmon populations.

Habitat Evaluation/Suppression Effect

In the FCR document, Ecology states that, consistent with EPA guidance (the Framework) and policy and precedence established by Ecology for the cleanup of contaminated site (Port Angeles – ITT Rayonier), fish and shellfish habitat quality and abundance must be evaluated and considered when establishing a site-specific fcr for clean up purposes.

The Suquamish Tribe disagreed with EPA when this policy decision was included in the Framework and does not support its inclusion as general practice in Ecology's regulatory decisions.

In cases where specific tribal consumption survey is available, or if recommended by a tribe as representative of tribal consumption patterns, regulatory assessments and decisions should incorporate that survey information. This approach is consistent with the hierarchy of preferred data sources that is the basis of the AWQC methodology. Fish and shellfish consumption surveys of local watersheds representative of the people being addressed for the particular water body are recognized as the highest preferred source of data.

The Suquamish survey was conducted with the expectation that the reported rates would be utilized in risk assessments to result in clean up levels protective of human health as well as of benefit to the natural resources upon which Suquamish tribal members continue to depend. As recognized by both EPA and Ecology, the Suquamish survey is a technically defensible study, representing actual tribal consumption patterns, at the time of the survey (2000). Section 6 of the FCR document should be clarified to incorporate tribal consumption survey data when evaluating RME scenarios and establishing site specific consumption rates pertaining to tribes

It should be noted, however, that it is likely the reported Suquamish consumption rates are suppressed. Tribal members have already reduced or changed their consumption rates. According to the survey, about 50% of respondents who said that they eat less seafood now reported the cause as pollution, including red tides, and related restrictions and regulations concerning harvesting. The following harvest data from areas of Dyes Inlet which have been re-opened since 2003 demonstrate that Suquamish consumption rates are likely to be suppressed and that tribal harvest will increase as water quality and habitat improve:

Dyes Inlet Harvested Manila Clam Totals:

Year	Harvests	Total lbs.
2005	18	116,810
2006	5	25,784
2007	13	78,353
2008	5	44,153
2009	7	34,985
2010	12	34,209
2011	16	48,674

(Source: Suquamish tribal harvest records.)

Despite its policy decision in the Framework, EPA recognizes that if cleanup levels are based on suppressed rates related to impaired habitat, such decisions may not be protective of future beneficial uses. From the 2002 report on fish consumption and environmental justice by the National Environmental Justice Advisory Council (NEJAC), "...When agencies set environmental standards using a fish consumption rate based upon an artificially diminished consumption level, they may set in motion a downward spiral whereby the resulting standards permit further contamination and/or depletion of the fish and aquatic resources."

Habitat evaluations should not be used to justify lower consumption rates in tribal U&A.

Additional Factors to Be Considered in Selecting FCRs in Tribal U&A

Treaty-reserved rights to safely access and harvest seafood are legal obligations.

The safe harvest of seafood is a reasonably anticipated future use in tribal U&A.

To ensure protectiveness, Ecology risk assessments should incorporate a "resource switching" approach that holds constant the total fcr.

Other risk assessment parameters and risk management levels, including exposure duration, fraction ingested and cancer/non-cancer thresholds, should not effectively reduce the total fcr.

Sincerely,

Denice Taylor
Environmental Programs
Fisheries Department
Squamish Tribe

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January 18, 2012

Via E-mail (fishconsumption@ecy.wa.gov)

Mr. Ted Sturdevant
Director
Department of Ecology
State of Washington
P.O. Box
Olympia, WA 98504-

Re: Comments on Fish Consumption Rate Technical Support Document

Dear Director Sturdevant:

Please accept these comments on behalf of Inland Empire Paper Company (IEP) on the Fish Consumption Rate Technical Support Document (TSD) published by the Department of Ecology in September 2011.

IEP urges Ecology to suspend development of default statewide fish consumption rates (FCRs) until a more thorough scientific evaluation can be performed to assess any public health benefits. The TSD document provides a superficial analysis of complex scientific issues and a number of policy determinations that are not appropriate for a technical guidance document. The TSD cites to a difference between assumptions used in cleanup standards under the Model Toxics Control Act (MTCA) and human health criteria in the state Water Quality Standards. There is no explanation, however, why the assumptions in MTCA cleanup standards and Water Quality Standards have to be the same. The standards regulate different media and presumably different risk exposures. Furthermore, there is no explanation as to why new FCRs are necessary to protect human health. Ecology appears to assume that the human health criteria in our Water Quality Standards are not protective but there is no discussion in the TSD as to how Ecology reached that determination, and specifically whether new FCRs will provide any meaningful difference in protecting human health. The document itself was also adopted in clear violation of the Administrative Procedure Act (APA). Absent compliance with the procedural rulemaking requirements, including the requirements for significant legislative rules, the TSD cannot be legally relied on in any future standard setting and any standards relying on the TSD would be considered arbitrary and capricious.

1. The Adoption of FCRs Must Comply with APA Rulemaking Requirements for Notice and Public Comment

Default FCRs cannot be lawfully established without compliance with the APA rulemaking procedures. Ecology must provide notice and an opportunity to comment on any proposed rule pursuant to RCW 34.05.320 and 325. A central requirement for rulemaking is the opportunity for meaningful participation by parties who will be impacted by the rule. Laws of 1995, ch. 403, §(2)(d). Ecology cannot provide an adequate opportunity to comment on the basis for the recommended FCRs until they are subject to consideration in the context of actual standard setting.

The importance of these considerations is documented in the January 11, 2012, comment letter from the National Council of Air Stream Improvement, Inc. The TSD document fails to provide an assessment of relative human health risks associated with the existing FCRs and the default FCRs in the TSD or to what degree health risk would be reduced by changing the FCR. There is no analysis of the health risks associated with the general population, no consideration (or at least disclosure) of the data and methodology in several of the fish consumption studies and weak statistical assumptions are used to weigh the data.

Ecology must accordingly defer any FCR determination to full rulemaking under the APA with adequate public notice and an opportunity to comment on these and other aspects of the FCRs.

2. The Adoption of Default FCRs is Subject to APA Rulemaking Requirements for Significant Legislative Rules

Statewide default FCRs must be adopted as significant legislative rules as defined in RCW 34.05.328. The APA requires Ecology to prepare a statement of the goals and specific objectives for the default FCRs. Ecology is also required to provide, at the time it issues public notice of rulemaking, a cost benefit analysis that documents the alternatives considered by the department, including a determination that the selected standard is the least burdensome alternative. There must be substantial evidence in the record that explains how the rule meets the goals and specific objectives of the department. This documentation must be sufficient to persuade a reasonable person that the determinations are justified. Finally, RCW 34.05.328 requires Ecology to include an implementation plan with the notice of rulemaking.

It is not reasonably possible to comment on the merits of the recommended FCRs in the TSD document without the required disclosure for significant legislative rules. Nor would it be appropriate for Ecology to adopt statewide default FCRs without a cost benefit analysis and implementation plan for the resulting standards.

Additionally, the goals and objectives of the TSD FCRs may be considered arbitrary and capricious unless there is an evaluation of what additional level of human health risk is protected by use of the TSD default FCRs compared to the current FCR assumptions in the MTCA and Water Quality Standards.

Ecology should not pursue default FCRs until it has articulated a coherent goal and specific objective for protection of human health based on rigorous, peer reviewed science and the specific criteria on what science will be used in the assessment. It is also inappropriate for Ecology to embark on this effort without first assessing the costs and benefits of the proposal together with a detailed implementation plan.

3. Ecology may not Lawfully use a Guidance Document to Circumvent APA Rulemaking Requirements

Ecology should recognize that it cannot bypass rulemaking requirements by adopting default FCRs in a guidance document. Washington Courts have been clear that adoption of a substantive rule requires compliance with APA rulemaking requirements. In *Simpson Tacoma Kraft Co. v. Ecology*, 119 Wn.2d 640, 835 P.2d 1030 (1992), the Court invalidated Ecology's promulgation of dioxin numeric water quality standards because Ecology did not utilize APA rule-making procedures. The Court emphasized the important purpose of rule-making procedures in providing the public with notice and an opportunity to comment. *See also Hillis v. Ecology*, 131 Wn.2d 373, 932 P.2d 139 (1997)(internal agency procedure for processing water rights had to be adopted by rule).

Federal courts have similarly held that EPA cannot bypass public participation requirements through the use of "guidance" documents. *See National Mining Assoc. v. Jackson*, No. 10-1220, 2011 WL 124194 (D. D.C. Jan. 14, 2011). The Court held: "If an agency adopts a new position inconsistent with an existing regulation, or effects a substantive change in the regulation, notice and comment are required." *Id.* at *8. The Court found that because EPA was treating the Guidance Memorandum as binding, and it had a practical impact on permit applicants, the memorandum was a legislative rule—an "agency action that has 'the force and effect of law'", and thus public notice and comment was required. *Id.* at *5, 6, 8.¹ *See also Appalachian Power Co. v. EPA*, 208 F.3d 1015 (D.C. Cir. 2000); *CropLife America v. EPA*, 329 F.3d 876 (D.C. Cir. 2003);

Conclusion

Ecology should commit to respond to all comments received on the TSD document and agree to further suspend development of default FCRs until a proper and thorough scientific assessment can be performed to validate any public health benefits. Ecology should further commit to subjecting any default FCRs to rulemaking as significant legislative rules.


¹ EPA objections or modifications to permits are generally regarded as final agency action. *See Crown Simpson Pulp Co. v. Costle*, 445 U.S. 193, 196, 100 S.Ct. 1093, 63 L.Ed.2d 312 (1980).

January 18, 2012
Page 4

I appreciate your consideration of these comments.

Sincerely,

TUPPER MACK WELLS PLLC



JAMES A. TUPPER, JR.

4844-7806-9006 (Version 1)

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January 18, 2012

Mr. Ted Sturdevant
Director
Washington State Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Re: Boise Inc. comments on Ecology's "Fish Consumption Rates Technical Support Document, A review of Data and Information about Fish Consumption in Washington", Publication No. 11-09-050

Dear Director Sturdevant:

Boise Inc. submits the following comments to the above-referenced publication and Ecology's request for public comment.

Boise Inc. operates a pulp and paper mill at Wallula, WA in Walla Walla County on the Columbia River. We operate under an NPDES permit to discharge to the Columbia River. We employ 429 skilled workers and have been a steady employer operating since 1959. Additionally, we are the largest taxpayer in Walla Walla County, representing an important funding source for important educational, law enforcement, and first responder needs.

Our continued livelihood depends on sustainability of our community, our work force and sustainable stewardship of the natural resources we utilize. Environmental excellence is the cornerstone of our operations and we are very proud of our record of excellence and ISO14001 Environmental Certification. We have not been immune to the recent economic downturns and have experienced some periods of reduced operations. Any new or unnecessary regulations can represent a severe hardship to continued business.

After reviewing Ecology's rationale for establishing a new fish consumption rate, and in consultation with research experts from the National Council of Air and Stream Improvement (NCASI), we are very concerned that the imposing of the highest fish consumption rate (FCR) as suggested would be overly protective and is not justified in terms of overall benefit to public health. The proposed range of default FCRs overstates the fish consumption rates and is representative for small subsets of the entire population and not the majority of the public. We are deeply concerned that a flawed technical basis for an increase in the FCR will result in inappropriate public policy decisions and regulatory outcomes.

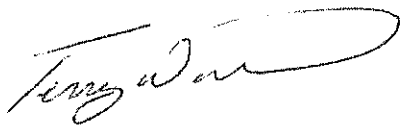
As part of the regulated community we are concerned that these rates are overly protective and could result in significant expenses in permitting and operating our NPDES waste water plant. The regulatory outcome is uncertain and compliance may not be technically or economically feasible. This uncertainty could significantly affect any future business investment at the Wallula Mill.

Page 2
January 18, 2012

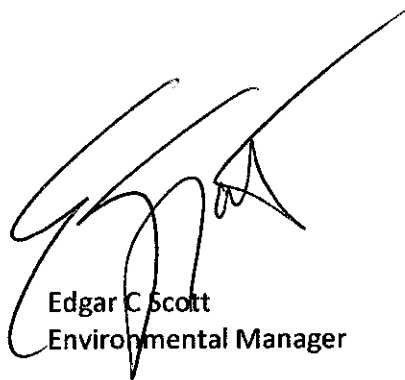
Further, imposition of extremely restrictive standards could overstate health concerns and result in apprehension on the part of sport and subsistence fish consumers and on the image of Washington's wildlife resources. Many studies indicate there are far more health benefits from a greater consumption of fish. We believe the appropriate balance between these two issues has not been fully evaluated in Ecology's analysis.

We are enclosing the comments from NCASI and respectfully request that Ecology answer the concerns related to the science and methodology as it considers whether to revise the sediment management and water quality standards. If small or specific populations are used for the development of a rule, then associated risk should not be applied equally to the entire state of Washington and the public at large. Standards development must take into account the protection of the general population and also consider the social and economic impacts as well as the technical and economic feasibility of implementing more restrictive standards. We hope that this is helpful and we look forward to learning more about this important subject.

Sincerely,



Terry Ward
Mill Manager



Edgar C. Scott
Environmental Manager



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Washington State Senate Republican Caucus

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January 18, 2012

Ted Sturdevant, Director
Washington State Department of Ecology
Post Office Box 47600
Olympia, Washington 98504

RE: Comments on Publication No. 11-09-050, *Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington*

Dear Director Sturdevant:

This letter is in response to Ecology's proposal to increase the default fish consumption rates for the State of Washington which are assumptions about how much fish and shellfish residents eat. Since the default fish assumption rates will be used to update water quality and pollution control standards in the near future, we would urge Ecology to carefully analyze this proposal, including thoroughly evaluating the science used to justify it, before proceeding with changing the default rates.

Although Ecology's review of the fish consumption rates is not official rulemaking, the default fish consumption rates will have significant regulatory ramifications because they will be used in updating the following water quality and pollution control standards: (1) Sediment Management Standards (WAC 173-204); Surface Water Quality Standards (WAC 173-201A); and 3) the Model Toxics Control Act (WAC 173-340).

While future water quality and pollution control regulations must be updated in compliance with the significant rule requirements of the Administrative Procedure Act (RCW 34.05.328), it is unclear whether citizens would have the opportunity to debate the science used to justify the new default fish consumption rates during the subsequent rulemaking because the default rates would have already been adopted.

This is problematic for a couple of reasons. First, the fish consumption default rates will be the basis for determining the appropriate level of environmental protection that is needed when updating these regulations and need to be thoroughly vetted before adoption. Second, formal rulemaking would require Ecology to follow certain procedures that we do not believe are being followed currently for this proposal. Examples are: responding in writing to all comments (including on the science), justifying its final decision in writing, analyzing whether its standard is stricter than federal law, and performing a cost-benefit analysis.

Without engaging in these procedures, Ecology's future rulemaking will be undermined because the basis for their rulemaking, the fish consumption rates, will not have been adopted in a deliberate and open manner. Because of the significant regulatory impact these default rates will have, we urge Ecology to follow the rulemaking process identified above so that the science on this issue is thoroughly vetted before the rates are set. This approach will have the benefit of giving credibility to future rulemaking on water quality and pollution control standards.


We also believe it is important to proceed cautiously because Ecology's proposed range raises the likely possibility that we could have the highest fish consumption rates in the nation. Specifically, Washington's current rate is 6.5 grams a day for water quality standards and 54 grams per day in the Model Toxics Control Act regulation. Ecology recommends increasing that rate at a range of 157-267 grams per day. This is at least 24 to 41 times the current amount for water quality standards and 2.9 and 4.9 times the amount for the MTCA standards. Since Oregon currently has the highest fish consumption rate at 175 grams per day, the range offered by Ecology could render our state's rates the highest in the nation. This is a remarkable increase in the rates and must be scientifically justified and thoroughly debated before adopted.

We are also concerned about the economic impacts from this proposal. Higher fish consumption rates mean few toxic pollutants would be allowed in state waters and result in stricter environmental standards. We want to ensure that stricter environmental standards are scientifically justified and do not negatively impact our state economy.

Just recently, it was reported in the media that Kimberly-Clark's Everett mill was closing after negotiations broke down with a potential buyer over compliance with environmental issues. The mill's closure resulted in the loss of 750 jobs. Performing a cost-benefit analysis on this proposal will provide important analysis to help determine the appropriate rate that should be set in Washington.

We all want clean water to protect healthy fish and Washington citizens, but we want to make sure a deliberative process is followed in developing regulations to ensure that such regulations are scientifically justified. We urge Ecology to incorporate the processes we have listed above to make sure this is accomplished with the default fish consumption rates.

Sincerely,



Senator Mike Hewitt
16th Legislative District



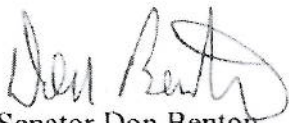
Senator Doug Ericksen
42nd Legislative District



Senator Mike Carrell
28th Legislative District



Senator Jim Honeyford
15th Legislative District



Senator Don Benton
17th Legislative District



Senator Mark Schoesler
9th Legislative District



Senator Joe Zarelli
18th Legislative District



Senator Curtis King
14th Legislative District



Senator Dan Swecker
20th Legislative District



Senator Val Stevens
39th Legislative District



Senator Bob Morton
7th Legislative District



Senator Linda Evans-Parlette
12th Legislative District



Senator Randi Becker
2nd Legislative District



Senator Jerome Delvin
8th Legislative District



Senator Mike Padden
4th Legislative District

Cc:

Governor Chris Gregoire

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January 18, 2011

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Re: Comments on Department of Ecology's
"Fish Consumption Rates, a Technical Support Document"
Publication no. 11-09-050

To Whom It May Concern:

General Metals of Tacoma, Inc., dba Schnitzer Steel of Tacoma (Schnitzer) appreciates the opportunity to provide comments on the Washington State Department of Ecology (Ecology) report entitled *Fish Consumption Rates, a Technical Support Document* (FCR report).

Schnitzer is a key stakeholder in the rule revision processes that will ultimately be affected by Ecology's decisions regarding proposed revision of the Fish Consumption Rate (FCR). Schnitzer has been an active participant in Ecology's ongoing efforts to revise the Sediment Management Standards (SMS). We have also been an active participant in the Water Quality rule revision meetings and fish consumption workshops. Our primary Washington facility is located on the Hylebos Waterway in Tacoma. Discharges from our Tacoma facility are governed by an Ecology-issued Individual National Pollutant Discharge Elimination System (NPDES) Permit. The Hylebos Waterway has also been the subject of many investigations and subsequent remedial actions. Schnitzer is a member of the Head of Hylebos Cleanup Group (HHCG) which conducted sediment assessment and remediation activities in coordination with the U.S. Environmental Protection Agency (EPA). The HHCG continues to work with the EPA to conduct post remediation monitoring within the water way. The development of a new FCR has the potential to significantly affect Schnitzer's numerous compliance activities associated with these important regulatory requirements and on-going remedial activities.

Schnitzer understands that development of a new FCR is a sensitive issue with broad implications. It is indeed challenging to develop a realistic and appropriate FCR which accurately represents the approximate 6.7 million residents of the State of Washington. While it is understood that the current FCR may not appropriately represent current fish consumption patterns, defensible scientific methods should be used to ensure a FCR, or range of FCRs, are developed that are technically defensible, based on strict scientific principles, feasible, and lead to cost effective cleanup/remediation levels, and regulatory compliance objectives. Schnitzer commends Ecology for embarking down this path to update current FCR values, and offers some brief comments on the aforementioned document, as well as a possible option for implementation that conforms to components

of the Model Toxics Control Act (Washington Administrative Code [WAC] Chapter 173-340) and the proposed draft SMS (WAC 173-204).

Specific Comments

Schnitzer offers the following comments on the FCR report:

1. FCR Should be Based on Representative Studies

The current FCRs (Water Quality Standard of 6.5 grams per day) are based on studies that were conducted in the mid-1980s (National Toxics Rule) and a MTCA value (54 grams per day) established in 1991. Ecology states in the FCR report that a goal is to develop a new FCR based on up-to-date information. We agree that it is appropriate to revise the FCR based on current fish consumption information. The studies cited in the FCR report were conducted in 1994, 1996, 1999, and 2000. While this information is more current than the information used to develop the existing rates, it is still relatively old data and may not be representative of current fish consumption patterns. In addition, the surveys evaluated the consumption patterns of 1,188 adults within a focused sample group. Based on a Washington State population of over 6.7 million, only 0.02% of the State was surveyed regarding fish consumption rates. The data presented in the reports is not up-to-date, and the FCR developed based on a survey of 0.02% of the population represents a tightly focused survey of a small sample population. We believe survey efforts should be expanded to ensure that regulatory decisions are based on a broad evaluation of all fish and shellfish consuming populations within the State of Washington.

2. The FCR Studies should be Scientifically Peer-Reviewed by an Independent Third Party

Peer review plays an important role in evaluating data, conclusions, and recommendations in any publication; especially a scientific document that could be used to develop regulations or guidelines. The peer reviewed document becomes the foundation by which the regulations are built upon. The fish consumption surveys conducted from 1994 through 2000, and used for this FCR report, should be peer reviewed by an independent third party selected by an unbiased neutral party to determine the scientific validity of the study conducted and the appropriateness of its conclusions. The FCR report should also undergo a similar scientific peer review process. It is critical that the peer reviewer(s) be a third party without ties to the primary author or group to avoid any potential biases. It is unclear based on the information provided in the FCR if the older fish consumption surveys were appropriately peer reviewed, and if so, what the findings of the peer reviews were.

3. One Fish Consumption Rate Does Not Fit Every Site

MTCA (WAC 173-340) is an excellent set of regulations that outlines a relatively streamlined approach which could also be of value if applied to the question of

appropriate FCRs. One of the core principles of this approach is its built-in flexibility to allow cleanups to be addressed on a site-specific basis, based on each site's unique risk profile. For example, Section 173-340-357 (Quantitative Risk Assessment of Cleanup Action Alternatives) states that "... modifications, adjustments to the reasonable maximum exposure (RME) scenario or default assumptions may also be made." In addition, Section 173-340-708(3)(a) states that "Cleanup levels and remediation levels shall be based on estimates of current and future resource uses and reasonable maximum exposures expected to occur under both current and potential future site use conditions..." There are other components of the MTCA approach that allow for site-specific information to determine cleanup levels. The proposed draft SMS revision also states in Section 173-204-500(1) that one of the steps to be followed is "...to determine a site-specific cleanup standard." Section 173-204-571(4)(a) of the proposed draft SMS revision also states that "The department may approve a site-specific fish consumption rate [emphasis added]."

Other regulations within the State encourage site-specific evaluation to determine appropriate site specific risk profiles and associated cleanup levels. This risk-based approach is the basis for MTCA and the SMS. We recognize that there are some water bodies that are more heavily utilized for subsistence fishing. Similarly, there are other water bodies that have remained primarily industrial with little to no subsistence fishing since they were first modified over 100 years ago, and other water courses with limited access to allow subsistence fishing. To assume that one FCR, based on a tightly focused consumption survey of 0.02% of the state's population, fits every water body within the State is not realistic based on current and projected site use, and is not consistent with previous Ecology decisions. Simply put, the focused population survey is not representative of the "reasonable maximum exposure" for every water body in Washington.

A Path Forward – Consistent with Other State Regulations

Ecology is in a difficult position as it strives to develop a FCR that can be used to calculate cleanup, remediation and water quality levels that are protective of the reasonable maximum exposure; while at the same time revise two significant sets of regulations (SMS 173-204 and the Water Quality Standards 173-201). We believe the combination of a decision to base a FCR evaluation of a survey of 0.02% of the state's population, and focus upon a group of stakeholders which is not representative of the state as a whole, is contrary to a scientific approach that is more easily defensible from a scientific perspective. We propose an approach that reconciles the site-specific risk evaluation elements of MTCA and the proposed draft SMS rules with Ecology's decision to protect the most highly exposed portion of the State's population that consumes large amounts of fish and shellfish.

In keeping with the language within MTCA and the proposed draft SMS, and consistent with the site-specific risk evaluation approach that dominates these regulations, we recommend that Ecology consider a range of FCRs that are based on "reasonable

maximum exposure.” This approach would develop FCRs which are appropriate for each water body’s unique characteristics based on consideration of site-specific criteria such as:

- How are the local water body and adjacent uplands currently used? Is it pristine (no development or protected), an urban water body (light, non-impacting industry, residential, private mooring), or is the water body industrial (shipping, heavy industrial operations, port activity, etc.)
- What is the potential future use of the water body? Will the water body always be industrial or is it likely to eventually revert to more pristine conditions?
- What is the hydrologic setting for the water body? Is it in a stressed environment (i.e. low dissolved oxygen levels). Is there ample flushing of the environment? Is the area prone to sediment accumulation or erosion?
- Is the water body currently used for fishing or shellfish harvesting?
- Are there any restrictions on the water body imposed by other regulatory agencies (Fish and Wildlife protected areas, existing State or Federal sediment cleanup sites, deed restrictions)?
- What is the *realistic* conceptual site model for the site?
- What is the “reasonable maximum exposure” for the site?
- What is the appropriate FCR for the water body considering all of the parameters identified above?

The decision tree to assess the water body could be defined in the proposed draft SMS rule or under a separate document. Efficiencies could be realized by tying the proposed draft SMS rules with the Water Quality rules currently being revised. While it may take a little more effort to develop the decision tree, in the end it would result in a pathway that could lead to a more realistic approach for evaluating human and ecological risks that could result in cleanup, remediation and water quality levels that reflect reality.

Another benefit of the multi-FCR approach is that it would result in a technically defensible solution; and as appropriately stated in MTCA, “... whose incremental costs are not disproportionate to the incremental benefits.” Basing risk levels on unrealistic exposure scenarios that do not reflect the current or potential use of a specific water body will only serve to drive the cleanup, remediation and water quality levels to concentrations that cannot be achieved or maintained with today’s technology and are based on the protection of a tiny fraction of the population even if they do not actually utilize the site for the suggested purposes. We fear that a “one size fits all” policy decision regarding the FCR would have a damaging economic impact on businesses within the state and further cripple our struggling economy.

Failure to apply a site specific approach would also lead to extended cleanup timeframes for remediation projects as they will be bogged down in debates and negotiations as

potentially liable parties struggle with the realities of cleaning sites up to background concentrations that are not technologically achievable. With every delay of cleanup implementation the potential threat of contamination remains.

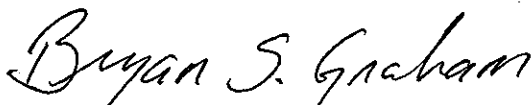
Conclusion

Ecology must develop a regulatory framework that ensures the protection of human health, aquatic habitats, and economic viability of the State of Washington. The protection of one element at the expense of the others is not consistent with Ecology's mandate to "protect Washington's quality of life – environmental, economic, and social."

We look forward to discussing these comments with Ecology and to developing a regulatory approach for sediment management and water quality that achieves Ecology's goals while safeguarding both the health of Washington's citizens and the economic viability of industry in Washington. We believe it is possible to accomplish both of these goals, and favor the adoption of appropriate legislation or formal rules that incorporate a site-specific approach to FCRs based on a set of realistic assumptions which build on existing environmental regulatory programs and requirements.

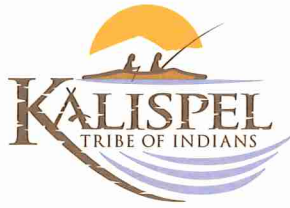
Sincerely,

General Metals of Tacoma, Inc., dba Schnitzer Steel of Tacoma



Bryan S. Graham, LG, LHG

cc: Matthew Parker
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January 17, 2012

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RE: Comments to Fish Consumption Rate Technical Support Document

The Kalispel Tribe urges the Department of Ecology to adopt a more protective fish consumption rate. A higher fish consumption rate will lead to more protective water and sediment toxics criteria for all people—especially people such as the Kalispel Indians who eat a large amount of fish, similar to the other Upper Columbia Basin Tribes. It is well documented that the Kalispel people always relied heavily on the salmon fishery of the upper Columbia River and resident fish of the Pend Oreille Basin until anadromous fish were extirpated and resident fish were largely eliminated by dams and commercial fishing.

With the above in mind, the Kalispel Tribe believes the following points must be considered in setting a protective state-wide fish consumption rate:


1. Kalispel people historically consumed fish at rates very similar to other upper Columbia tribes. Current Kalispel fish consumption rates are depressed from historical rates for most members of the tribe and not consistent with what they would be if the native fisheries had not been extirpated by dams. A heritage consumption rate should be used to protect tribal members who are consuming non-native fish at historic native-fish consumption levels, and to ensure that tribal members can safely consume native fish at historic levels as populations of those fish are restored.
2. The use of statistical analyses on depressed consumption rates for Columbia Basin tribes does not establish adequate long-term water and sediment quality targets needed to protect aquatic resources for the most vulnerable people. As lost fisheries are restored and become readily available to tribal members, tribal consumption rates will trend toward historic rates well above 300 grams/day. To avoid perpetuating an

environmental injustice on tribal members, the State must ensure its waters are clean enough to support this level of consumption.

3. Environmental justice problems are further perpetuated by expecting that tribes can cure fish contamination problems by adopting higher consumption rates in their own water quality standards. It is unreasonable to expect that tribes will be able to adequately protect tribal rights to harvest and consume traditional quantities of fish by promulgating more protective standards over a discrete part of a larger watershed.
4. Setting an appropriate fish consumption rate needs to be established independent of economic interests. Economic impacts on special interests are concerns for developing implementation programs necessary to achieve required pollution reduction, not for curtailing consumption rates for vulnerable people.
5. Other factors used in equations to develop the sediment and water quality criteria must also be applied in a conservative manner so that unreasonable health risks are not allowed to undermine protection of people and aquatic resources.

If you would like to discuss any of these comments in more detail, don't hesitate to contact me, or my Water Resources Manager, Ken Merrill.

Regards,



for

Deane Osterman, Executive Director
Kalispel Natural Resources Department

January 18, 2012

Martha Hankins
Toxics Cleanup Program
Washington Department of Ecology
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Subject: *Fish Consumption Rates Technical Support Document (September 2011)*

I am submitting this letter to provide comments on the Washington State Department of Ecology's (Ecology's) *Fish Consumption Rates Technical Support Document* (September 2011), which has been posted for public review. I am submitting these comments as a concerned private citizen, and these comments should not be construed as representing those of my employer or any of my clients. I appreciate Ecology's interest in protecting the public from exposure to chemicals in fish (and, more broadly, seafood in general, including shellfish) at concentrations that result in unacceptable risks to human health, and I recognize the important treaty rights of Native American tribes to harvest and consume traditional seafood items. It is apparent that Ecology has put considerable effort into preparing this document, and it obviously represents a valuable compilation of a lot of information on the topic of fish (and other seafood) consumption rates in Washington State. However, I have serious concerns about Ecology's intended use of the fish consumption rates put forth in that document, and with the way those rates were developed.

No Indication of How These Rates Will Be Used

The most fundamental problem with the document is that it considers fish consumption rates in a vacuum, with very little mention of how those rates might be used in specific regulatory programs. Clearly, there are intended uses of these rates in establishing water quality criteria under the state Water Quality Standards, surface water cleanup standards under the state Model Toxics Control Act (MTCA), and sediment cleanup standards under the state Sediment Management Standards. However, the report states (on page 73):

"This report does **not** examine the implications or results of updating the fish consumption rates in these various regulations. This report is focused solely on the data available on fish consumption in the state of Washington. Other materials being prepared concurrently will examine in detail the policy considerations and implications."

I believe that the utility of these rates can only be understood in the context of their exact uses in these regulatory programs. I am aware that some of the fish consumption rates referred to in this document have already been included both as the basis for risk assessments at state-lead sediment sites under MTCA and in the evaluation of open-water disposal of dredged materials under the Dredged Material Management Program (a joint program of the U.S. Environmental Protection Agency (EPA), Ecology, the Washington Department of Natural Resources, and the U.S. Army Corps of Engineers). It can also be expected that these rates, if adopted by Ecology, will be used in the federal Comprehensive Environmental Resource and Compensation Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) programs within Washington State. I am also aware of what I consider to be totally inappropriate use of fish consumption rates, such as attempts by both Ecology and EPA to backcalculate upland groundwater and soil cleanup levels that would be protective of human health based on the tribal seafood consumption rates, assuming chemicals in

soil would migrate to groundwater, and the groundwater would be discharged to surface water bodies without dilution. It is important that implications of the application of fish consumption rates be understood in the context of all regulatory programs in which they are to be used. In some cases, as described below, I believe that the application of these rates will lead to untenable regulatory gridlock.

Allowable Tissue Concentrations Below Background

The *Fish Consumption Rates Technical Support Document* is based on the premise that the existing default fish consumption rates used in regulatory programs in Washington State are too low to protect significant numbers of consumers. Consequently, consideration is being given to revising upward those default rates (currently 54 g/day under MTCA and 6.5 g/day under the state Water Quality Standards). However, it is not at all clear that fish consumption rates above 54 g/day would allow for a greater degree of consumer protection. To understand why this would be so, it is necessary to calculate the tissue concentrations of common bioaccumulative contaminants that would be necessary to achieve acceptable risk levels. This is a subject that the technical support document is silent on, but something that is sorely needed. It is relatively straightforward to calculate the allowable tissue concentrations using standard risk assessment equations; all that is needed is selection of appropriate values for a few input variables (e.g., average consumer body weight, exposure duration, exposure frequency, acceptable risk level, fish diet fraction). For example, under MTCA, the target risk level for carcinogens is 1×10^{-6} excess cancer risk; using that risk level and MTCA's standard default values for the other variables, one can calculate the tissue concentrations of bioaccumulative contaminants that would be necessary to achieve an acceptable risk level. In the case of polychlorinated biphenyls (PCBs) and dioxins (two of the most common carcinogenic contaminants found in fish), the allowable tissue concentrations at a fish consumption rate of 54 g/day would be 1.3 $\mu\text{g/kg ww}$ (parts per billion, or ppb) and 17 pg/kg ww (parts per quadrillion, or ppq), respectively. In the case of PCBs, this allowable concentration is roughly an order of magnitude below (i.e., only about one tenth of) the background concentrations of PCBs in Puget Sound fish; for dioxins, this allowable concentration is well over an order of magnitude below background. Under MTCA, if a calculated risk-based level is below background, the cleanup level defaults to background (i.e., a risk-based goal below background is assumed to be unachievable). If a fish consumption rate greater than 54 g/day was selected, the allowable tissue concentrations would be even further below background, so no greater level of consumer protection could be expected.

Fish Held to a Higher Standard than Other Foods

Such calculations of the tissue contaminant concentrations that would be necessary to achieve specified target risk levels are also of interest by comparing those concentrations to the concentrations of those contaminants in other food products. For example, other protein sources such as beef, chicken, pork, and dairy products all contain PCBs and dioxins at concentrations that would represent unacceptable risks if these foods were consumed at the rates put forth in the technical support document. Indeed, as indicated on page E-11 of Appendix E of the technical support document, even wild Chinook salmon from southeast Alaska have PCB concentrations that would represent unacceptable carcinogenic risks if consumed at the MTCA default fish consumption rate, let alone the higher rates now being proposed by Ecology. Indeed, because of the worldwide atmospheric distribution of ubiquitous contaminants such as PCBs and dioxins, it is unlikely that any fish in the world have concentrations of these contaminants low enough to represent acceptable risks. I believe that it is unreasonable for Ecology to suggest that somehow

fish in Washington State should be held to a higher standard than other commonly consumed foodstuffs. Similarly, it is disingenuous to discourage public consumption of fish, recognizing that the public may turn to other protein sources without realizing that those also pose unacceptable risks by the stringent criteria of MTCA. It is incumbent on Ecology to do a much better job of risk communication on such issues if the public is to understand the risks associated with fish consumption in the context of other risks we all face in everyday life.

Carcinogenic Risks vs. Noncancer Health Outcomes

The aforementioned analysis touches on a related subject that also points out the need to consider these fish consumption rates only in the context of how they will be used in regulatory programs. That subject is the distinction between carcinogenic risks and noncancer health outcomes. Calculation of allowable tissue concentrations for contaminants such as PCBs, which have both carcinogenic and noncarcinogenic properties, will generally yield more stringent (i.e., lower) concentrations for carcinogenic effects than for noncarcinogenic effects. Using the standard risk assessment equations mentioned above with a target noncancer hazard index of 1 (as required under MTCA) yields an allowable tissue PCB concentration of 52 µg/kg ww (ppb), as compared to the allowable tissue PCB concentration of 1.3 µg/kg ww (ppb) for carcinogenic effects. Thus, the allowable tissue concentration to protect against noncancer effects may actually be above background concentrations, and therefore potentially achievable. It is notable that the Washington Department of Health issues seafood consumption advisories on the basis of noncancer effects, and not carcinogenic effects. There is good reason for this. In a recent journal article (Stone and Hope 2009; included as Attachment A) addressing this issue, the authors raise three arguments against using cancer risk as the basis for fish consumption advisories:

1. The benefits of fish consumption are widely recognized.
2. The standard methodology to predict cancer risk is likely to overestimate actual risk, often by orders of magnitude.
3. The public's real and perceived concerns about cancer may result in unintended consequences, such as avoidance of fish altogether.

As an alternative to cancer-based advisories, Stone and Hope suggest that future advisories incorporate a multidisciplinary public health framework focused on avoiding noncancer health outcomes and encouraging the public to consume a balanced diet rich in fish.

Unfortunately, both MTCA and CERCLA have risk targets for both cancer and noncancer effects, and I am aware of cases where both are being considered as the basis for establishing cleanup levels. As demonstrated above, it may not be possible to achieve acceptable risk levels for some of the most potent carcinogenic contaminants because the allowable tissue concentrations, calculated on the basis of highly conservative risk assumptions, are below background. On the contrary, achievement of tissue concentrations necessary to prevent noncancer health outcomes may be possible because they are above background. Hence, the identification of appropriate fish consumption rates for use in Washington State regulatory programs must consider what type of adverse health effects we are striving to avoid. If the state intends to consider cancer effects, the argument over what is the most appropriate fish consumption rate becomes a moot point. Even the current MTCA default consumption rate yields unachievable tissue concentrations (because they are below background), and the even higher fish consumption rates that are proposed in the technical support document would require even lower tissue concentrations. In either case, background becomes the default goal.

Risks for Individual Contaminants vs. Total Risks

Regulatory agency staff appear to be well aware that at high rates of fish consumption, allowable tissue concentrations of some of the most potent bioaccumulative contaminants will be below background concentrations. Nevertheless, some have voiced the opinion that these high consumption rates must still be considered in order to regulate other contaminants that may be less potent, and therefore have allowable tissue concentrations above background concentrations. This is a spurious argument, however. Fish everywhere have sufficiently high concentrations of potent bioaccumulative contaminants such as PCBs and dioxins as a result of worldwide atmospheric transport that they would represent unacceptable excess cancer risks if consumed at relatively high rates, even the MTCA default consumption rate of 54 g/day. Given that fact, it would be pointless to try to regulate the concentrations of much less potent contaminants in fish tissue because the overall magnitude of risk cannot be reduced below that associated with background concentrations of ubiquitous contaminants such as PCBs and dioxins. The risks of consuming fish and other seafood can only be meaningfully evaluated on the basis of the total risks associated with all contaminants they contain. Attempts to reduce risks by focusing on individual contaminants, while ignoring the risks associated with more potent and ubiquitous contaminants, would be futile. Ecology should recognize this fact, and not pretend otherwise.

Scientific Defensibility of Tribal Consumption Surveys

The technical support document goes into great depth describing the criteria that were applied to assess the scientific defensibility of the results of the various fish consumption surveys considered in the document. Ecology obviously recognizes the importance of making data available for scrutiny so that other researchers can verify results and test conclusions, and even refers on page 45 to a recent editorial in *Science* that makes that very point. However, the technical support document then states:

“Many Pacific Northwest tribal organizations or tribal governments do not provide their raw seafood dietary data to researchers outside of their sovereign tribal government or organizations. They may consider survey data as confidential and not allow independent evaluations. Data evaluation typically occurs through government-to-government agreements or tribal technical personnel.”

Despite all of the supposedly detailed assessment of the scientific defensibility of the fish consumption surveys that Ecology describes, I believe that the inability of anyone outside the tribes to independently evaluate the raw survey data seriously compromises the use of those data. For data that are to have such far-reaching and costly ramifications, I believe that a true assessment of the scientific defensibility of the surveys can only be conducted if the raw survey data are available for a complete and independent assessment of their conclusions. If the tribes truly want the results of these surveys to be considered, they should make the raw survey data available, and Ecology should then enlist the services of independent experts in the field of fish consumption surveys to evaluate those data to ensure that the conclusions can be supported. This is no different than if the tribes had their own scientists conduct studies of the toxicity of contaminants, but then put forth conclusions without allowing other scientists to see their results. The evaluation of any data considered for use in such regulatory settings must be totally transparent and subject to independent verification. I believe that the results of any fish consumption surveys that have not been subject to such scrutiny should not be used.

Although the raw survey data have not been made available for at least some of the tribal fish consumption surveys, there are enough incongruities and inconsistencies in some of the published results of those studies to raise serious questions. Although I have no reason to single out any one survey as causing concern, the results of the Suquamish tribal survey are sufficiently different from those of the other tribal surveys to warrant careful consideration. As shown in Table 1 of Appendix C of the technical support document, the Suquamish tribal fish consumption rates are substantially higher than those of the other four surveyed populations. For example, the mean Suquamish rate is 214 g/day, whereas the mean rates for the other surveys range from 63 to 117 g/day. The difference in the 95th percentile rates is even more pronounced: 796 g/day for the Suquamish vs. 176 to 306 g/day for the other four surveys. It is not readily apparent why the Suquamish rates should be so much higher. The very high 95th percentile rate is especially of concern because such high percentile values are often used to identify a "reasonable maximum exposure". When the number of people surveyed is relatively small, 95th percentile values are based on the responses of a very few individuals. In the case of the Suquamish, for example, there were 92 adults surveyed. For this number of respondents, the 95th percentile rate falls between the rates reported by the respondents with the 5th and 6th highest consumption rates among all of the respondents; the rates for all other respondents may be much lower but they have no bearing on the absolute value of the 95th percentile consumption rate. The fact that the 95th percentile rate for the Suquamish tribe is much higher than the reported rates for most of the tribal population surveyed is especially apparent in cumulative frequency plots in the Suquamish report; the top six or so respondents reported eating far more seafood than most of the other tribal members. Thus, the 95th percentile consumption rate for the Suquamish survey represents only a few individuals within the tribal population.

Review of the portion sizes (i.e., serving sizes per meal) reported in the Suquamish survey raises questions about the validity of these high seafood consumption rates. In Table T-8 of the Suquamish report (The Suquamish Tribe 2000), the mean, median, minimum, maximum, and 90th percentile portion sizes for various seafood categories are reported. Most of the tabled values appear plausible, with the exception of the maximum portion sizes for the various shellfish species. For bivalves (i.e., clams, mussels, oysters), the maximum reported portion sizes range from 1,134 g (2.5 pounds) for mussels to an incredible 2,720 g (6 pounds) for geoduck clams. I have a hard time envisioning anyone eating 6 pounds of geoduck clams in one meal. Without access to the underlying data, it is impossible to say what effect such extreme portion sizes might have had on the 95th percentile rate used in the HHRA. However, these extreme portion sizes certainly raise the question of whether the responses given by the individual(s) reporting such portion sizes are believable.

The issue of the credibility of survey respondents is a curious one. Although the same statistical consultants participated in the Tulalip, Squaxin, and Suquamish surveys, data "outliers" were treated differently. In the Tulalip/Squaxin survey report (Toy et al. 1996), the authors recognized that there were "a number of outliers representing unusually large consumption rates", and that "values such as these represent large but uncertain consumption rates". Rather than use these questionable values, the statisticians "recoded" these extreme values "to the largest reported consumption rate within three standard deviations of the arithmetic mean". That is, no reported consumption rate was allowed to be more than three standard deviations above the arithmetic mean of all respondents, regardless of what the individual tribal members reported.

In the Suquamish survey report (The Suquamish Tribe 2000), however, the authors (i.e., the same statistical consultants) reported that "a number of high consumption rates were included in

calculations of the mean, standard errors, and percentiles, in contrast to some preceding surveys (e.g., Toy et al.) where high values were considered as outliers and were truncated to a smaller value, such as the mean plus three standard deviations." Furthermore, the authors stated that "these high values were believed to represent actual high consumption and were not treated as outliers" and that inclusion of these high values had only very minor effects on the percentiles and mean consumption rates. Without access to the underlying data, however, it is impossible to determine whether this is in fact true. Apparently, the authors never questioned whether these respondents were truthful and whether their responses should be included. Indeed, the authors further justified their decision not to adjust potential outliers by saying "the study staff were familiar with a number of the individuals with large consumption rates and maintained that the reported rates were likely to reflect real consumption." Given that there were some respondents who reported truly extreme shellfish consumption rates (e.g., 6 pounds of geoduck clams in a single meal), this position presses the limits of credibility, and draws into question whether the responses from such individuals should have been included at all. In the absence of access to the raw survey data, it cannot be determined how many responses from those surveyed would have been identified as outliers. However, if any of the highest consumption rates (i.e., those reported by the top five or six respondents) had been identified as outliers and either excluded from the survey or truncated to a lower value (as they were in the Tulalip/Squaxin surveys), the resulting 95th percentile value would almost certainly have been lower, although to an unknown degree. This points out the importance of having access to the raw survey data and having outside experts review and confirm the analyses of those data.

Similar Issues with EPA Region 10's "Framework Document"

Ecology's technical support document cites the earlier "framework document" prepared by EPA Region 10 (i.e., *Framework for Selecting and Using Tribal Fish and Shellfish Consumption Rates for Risk-Based Decision Making at CERCLA and RCRA Cleanup Sites in Puget Sound and the Strait of Georgia*; EPA 2007) as lending credence to some of the analyses in Ecology's document. Unfortunately, EPA's framework document suffers from the same lack of transparency associated with not having access to the raw survey data. EPA's framework document was prepared by staff from EPA Region 10, without the benefit of review by any other state or federal agencies (e.g., Washington State Department of Health, Ecology, any offices of EPA outside Region 10 [including EPA headquarters]) or any experts in the development and application of seafood consumption surveys.

EPA Region 10 has been very careful not to refer to their framework document as a "guidance document", perhaps being aware that an EPA "guidance document" would be subject to considerably more scrutiny than this document was ever expected to receive. Indeed, the Office of Management and Budget (OMB) requires that a guidance document must be: (1) developed with appropriate review and public participation, (2) accessible and transparent to the public, (3) of high quality, and (4) not improperly treated as legally binding requirements. Among other things, a guidance document must also include the term "guidance" or its functional equivalent in the title, have a document identification number, and a citation to the statutory provision or regulation it interprets or to which it applies. The agency must post the guidance document on the section of its website designated for significant guidance documents, provide for public comment, and provide a link from the guidance document to the public comments. The agency must also designate an office to receive and address complaints by the public that the agency is not following the procedures required by the OMB. EPA Region 10 apparently did none of these things in developing the framework document and therefore it should not be considered to be guidance.

For documents such as the framework document, EPA Region 10 does require those preparing the document to complete a form titled "Region 10 Information Quality Guidelines Pre-dissemination Checklist." One of the questions to be answered is "Does the work product meet 'quality' objectives?" Normally, "formal, external peer review" is necessary to meet agency criteria for quality. In the absence of external peer review, the following questions must be answered:

1. Is the information accurate and reliable?
2. Is the information unbiased?
3. Is the information useful?
4. Is the information secure?

EPA Region 10's guidelines regarding the first question indicate that if the data were developed or funded by EPA, the information may not be considered accurate and reliable unless the data were obtained under an approved quality assurance project plan (QAPP). If the data were not developed or funded by EPA, the data must be assessed against agency assessment factors to determine whether they are accurate and reliable. As indicated earlier, EPA Region 10's framework document is based on seafood consumption surveys of the Tulalip, Squaxin, and Suquamish tribes. The Tulalip/Squaxin surveys (Toy et al. 1996) were funded by EPA, but there is no evidence of a QAPP having been prepared. The Suquamish survey (The Suquamish Tribe 2000) was funded by the Agency for Toxic Substances and Disease Registry (ATSDR), and administered through the Washington State Department of Health. Again, there is no evidence of a QAPP having been prepared. The Suquamish survey results are reported only in summary form in a publicly available document (The Suquamish Tribe 2000), but the underlying data have never been released to anyone, including EPA. A consultant to the Suquamish tribe conducted all statistical analyses of the data. Given that neither EPA nor anyone other than the Suquamish Tribe and their statistical consultant has ever seen the data, there is no way to know whether the statistics are correct. Hence, it is not apparent how EPA could vouch for the accuracy and reliability of the Suquamish data.

It also appears that EPA further failed to comply with EPA Region 10's Information Quality Guidelines, which state that "influential information" should be subjected to a higher degree of transparency about data and methods, than other disseminated information. Prior to dissemination of "influential information," all five of the following questions must be answered in the affirmative:

1. Is the source of the data presented?
2. Are the various assumptions employed fully described?
3. Are the analytical methods fully described?
4. Are the statistical methods fully described and discussed?
5. Do all the original and supporting data meet the above criteria, to the extent practicable, given ethical, feasibility, and confidentiality constraints?

Because EPA has not seen the underlying data from the Suquamish survey, it cannot answer all of these questions affirmatively. The lack of opportunity to review the underlying data used in development of EPA Region 10's framework document compromises the transparency of the process, which, just as in the case of Ecology's technical support document, is necessary for any document with such far-reaching implications.

Difficulty in Translating Allowable Tissue Concentrations to Other Media

There appears to be an implicit assumption in the technical support document that once an appropriate fish consumption rate is chosen, allowable tissue contaminant concentrations can then be calculated, and, based on those, it will be possible to calculate the allowable contaminant concentrations in environmental media (e.g., surface water, sediments) necessary to achieve those tissue concentrations. There are at least two ways to do this, one of which is very data-intensive, site-specific, and expensive, while the other is much simpler but subject to considerable uncertainty. The first way is through the application of food web models; such models have been applied to persistent, lipophilic contaminants such as PCBs and dioxins that bioconcentrate as they move up through a food web. Such a model was recently applied to PCBs in the Lower Duwamish Waterway Superfund site in Seattle, at the cost of several hundred thousand dollars. Despite the expenditure of such a large sum of money, the end result could likely have been predicted prior to modeling; the allowable tissue concentration is so low that an allowable sediment concentration could not be calculated, and therefore the allowable sediment concentration defaulted to background. The second way is to apply conversion factors known as bioconcentration factors (BCFs) or biota sediment accumulation factors (BSAFs) to convert tissue concentrations to surface water or sediment concentrations. Although commonly used, there is considerable uncertainty associated with the selection of appropriate values for such factors. Conversely, there are certain bioaccumulative contaminants (e.g., mercury, arsenic, carcinogenic polycyclic aromatic hydrocarbons [cPAHs]) whose uptake and bioaccumulation processes are much more complex and not amenable to either approach. Even if allowable tissue concentrations for these contaminants can be calculated, there is no easy way to translate those into surface water or sediment criteria.

Regulatory Implications

If Washington State were to adopt the fish consumption rates now being proposed by Ecology as the basis for such things as sediment and surface water criteria, there would be potentially enormous ramifications. First, it raises the public expectation that application of these consumption rates, in combination with the allowable risk ranges already inherent in MTCA and the state Water Quality Standards, means that Ecology believes that we could actually achieve acceptable risk levels. In reality, the sediment and surface water concentrations that would be necessary to achieve acceptable tissue concentrations, and thereby acceptable risks, would be below natural background. Therefore, we will never be able to achieve these very low risk levels. Ecology staff talk as though achieving natural background concentrations might be achievable within a few decades. In reality, centuries, or perhaps even millennia, might be more realistic, at least in urban areas.

If Ecology were to adopt the fish consumption rates proposed in the technical support document, we would be trying to regulate the contaminant concentrations in fish to much lower levels that allowable in other foodstuffs. Other protein sources such as beef, chicken, pork, and dairy products, not to mention fish from even relatively uncontaminated areas such as Alaska, all contain PCBs and dioxins at concentrations that would represent unacceptable risks if these foods were consumed at the rates put forth in the technical support document. Discouraging the public from eating fish because of contaminant concentrations that result in relatively low risks (i.e., any excess cancer risk greater than 1×10^{-6}), while ignoring the health benefits of eating fish, is not wise public policy, especially when alternative protein sources contain the same contaminants.

Overstating the risks associated with fish consumption by assuming overly conservative exposure scenarios has potentially very costly ramifications without a clear and documented benefit. It is

already apparent that use of the high tribal fish consumption rates will drive sediment cleanups to background (and still not achieve acceptable levels of risk). Furthermore, the perceived risks have the potential to eliminate the open-water disposal of dredged material, potentially having onerous financial ramifications for ports, which could be required to place all dredged materials in landfills even though the chemical concentrations in those materials may be below background concentrations in the area of the open-water disposal site. Similarly, high fish consumption rates may drive water quality criteria for bioaccumulative contaminants to background or even laboratory detection limits. The cost for any entity with a wastewater discharge (i.e., not only industries, but also municipalities) to have to try to achieve such concentrations in their discharge will be enormous, and it may not even be technically feasible to treat water to such low levels. I understand that Ecology intends to conduct an economic impact assessment for the current revision of the Sediment Management Standards only once a draft rule has been completed. I believe that it is incumbent on Ecology to consider the economic implications much earlier in the process; given the potential ramifications of the fish consumption rates on not only sediment standards, but also surface water quality criteria and surface water cleanup standards, such consideration of economic implications should occur now.

I fully recognize the sensitivity of Ecology's dealings with the tribes and the desire to protect tribal members in their treaty-protected right to consume traditional foods. Understanding the risks associated with high levels of seafood consumption is essential. However, as indicated earlier, Ecology's development of proposed fish consumption rates in the technical support document is seriously flawed in that there has never been an independent, outside review of at least some of the tribal fish consumption surveys that serve as the foundation of the process. Absent such an open review process, I believe that the technical support document cannot legitimately be applied as the basis for establishing higher fish consumption rates. If the tribes truly want the results of these surveys to be considered, they should make the raw survey data available, and Ecology should then enlist the services of independent experts in the field of fish consumption surveys to evaluate those data to ensure that the conclusions can be supported. Otherwise, the development of appropriate fish consumption rates is not the transparent process that it needs to be.

As noted at the beginning of this letter, many of the concerns raised in these comments stem from the lack of any indication on the part of Ecology about how these fish consumption rates will be used. The fish consumption rates cannot be fairly evaluated in a vacuum. It will only be possible to consider the full implications of the adoption of these fish consumption rates once Ecology has explained how they intend to use them.

Specific Comments

The following comments are directed at specific pages within the technical support document where errors were noted.

At several places in the technical support document, there are incorrect references to 284 as the number of adults included in the survey of the Suquamish Tribe's fish consumption. This error, which appears on pages 6, 56, 71, A-1, and C-1, apparently arose because Ecology relied on an Oregon Department of Environmental Quality report that contained the same error, rather than consulting the original Suquamish report. In the Suquamish report, it is stated that 284 adults were initially identified as being eligible to participate, but in reality only 92 adults were actually surveyed. Curiously, page 55 and Tables 3 and 4 in Appendix C of the technical support document report the correct number of adults included in the Suquamish survey (92); however, it cannot be

determined whether Ecology actually used this number in the weighting of results from the various surveys.

Page 6: Why was the 95th percentile rate for the Suquamish survey omitted from Table 1, given that it is reported elsewhere in the report (Table 1 in Appendix C). Was there concern that including this value (796 g/day) in the body of the report would be too alarming?

Page 7: This page states that Ecology's recommended range for a default fish consumption rate is 157 to 267 grams per day. Page 103 cites the same range. Inexplicably, page 111 then reports the recommended range as 150 to 275 grams per day.

Page 18: The first bullet on this page states "The life cycle and life history of salmon results in recycling the contaminant body burden to future generations of salmon." This statement is misleading. In reality, all fish pass a portion of their contaminant body burden on to the next generation in their eggs. The total mass of contaminants contained within juvenile salmon migrating from freshwater habitats into Puget Sound (resulting both from that acquired from their parent and from feeding within the freshwater habitats) has actually been shown to represent only a tiny fraction (about 1 percent) of the contaminant body burden in adult salmon. The rest is acquired in saltwater environments.

Page 20: This page refers to two-thirds of the state harvest of bottomfish in 2006 being from coastal waters, with the other third harvested from the marine waters of Puget Sound. It is not apparent what is meant by "coastal waters" (e.g., Pacific Ocean, Grays Harbor, Willapa Bay, Strait of Juan de Fuca?).

Page 74: This page provides an equation, said to be used under MTCA, for calculating surface water cleanup levels. However, that equation is incomplete in that it omits several important variables. Also, that equation is applicable only for carcinogenic effects. There is a separate equation that should be included in the technical support document to calculate surface water cleanup levels based on noncarcinogenic effects.

Thank you for taking my comments into consideration. I trust that they shed some light on some of the problems with the approach Ecology is considering with regard to fish consumption issues.

Sincerely,

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The Suquamish Tribe. 2000. Fish consumption survey of the Suquamish Indian Tribe of the Port Madison Indian Reservation, Puget Sound region. The Suquamish Tribe, Suquamish, WA.

The Suquamish Tribe. 2000. Fish consumption survey of the Suquamish Indian Tribe of the Port Madison Indian Reservation, Puget Sound region. The Suquamish Tribe, Suquamish, WA.

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Attachment

Stone, D. and B. K. Hope. 2009. Carcinogenic Risk as the Basis for Fish Advisories: A Critique. *Integrated Environmental Assessment and Management* 6(1): 180–183.

Carcinogenic Risk as the Basis for Fish Advisories: A Critique

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ABSTRACT

Fish advisories are important tools in public health practice and are primarily used to translate fish contaminant levels into consumption recommendations for consumers. Even when a targeted advisory is issued, it may alter broad food consumption patterns among the public, including diminishing intake of fish-based protein and polyunsaturated fatty acids. Such alterations may have both positive (e.g., reduced exposure to contaminants) and negative (e.g., loss of health benefits or cultural traditions associated with consuming fish) consequences. Currently, a fish advisory may be based on the potential for either noncarcinogenic or carcinogenic endpoints. Consumption recommendations based on a cancer outcome are likely to be highly restrictive, potentially diminishing opportunities for the recognized health benefits associated with a fish-rich diet. This possibility causes us to raise 3 arguments against using cancer risk as the basis for fish consumption advisories. First, the benefits of fish consumption are widely recognized. Second, the standard methodology to predict cancer risk is likely to overestimate actual risk, often by orders of magnitude. Third, the public's real and perceived concerns about cancer may result in unintended consequences, such as avoidance of fish altogether. As an alternative to cancer-based advisories, we suggest that future advisories incorporate a multidisciplinary public health framework focused on avoiding noncarcinogenic health outcomes and encouraging the public to consume a balanced diet rich in fish. We also suggest that decision makers need to 1) understand which elements of the advisory process are science and which are implicit or default policy, 2) consciously consider whether these policy elements are appropriate for their particular situation, and 3) if not, be willing to make and defend alternative policy choices. *Integr Environ Assess Manag* 2010;6:180–183. © 2009 SETAC

Keywords: Cancer · Fish advisories · Risk assessment · Risk communication · Regulatory policy

INTRODUCTION

People need protein in their diet and there are a variety of protein sources (e.g., soy, corn, wheat, rice, eggs, milk, muscle from meat, poultry, and fish). The factors that influence which protein source is consumed include availability, cost, and cultural preference. Fish are an excellent source of protein and omega-3 fatty acids, and consumption of fish has been shown to have demonstrable health benefits (Bouzan et al. 2005; Cohen, Bellinger, and Shaywitz 2005; Köing et al. 2005; Teutsch and Cohen 2005). Some populations, particularly subsistence and tribal fishers, rely heavily on self-caught fish as an economical source of protein. Some fish may, however, contain chemical contaminants at levels that, if consumed in sufficient quantities, could pose an unacceptable risk to health. Federal, state, and tribal governments protect the public from this threat by monitoring their waters and issuing consumption advisories when contaminant levels in fish are determined to pose an unacceptable risk (USEPA 2000a). Typically, a consumption advisory will recommend people limit or avoid eating certain species of fish caught from specific lakes, rivers or coastal waters. Such restrictions, if followed, require fish consumers to make trade-offs with respect to health, recreation, economics, community and traditional activities, as well as personal interests and other perceived benefits of fish consumption. Specific to health outcomes, consumers are presented with a trade-off

between the known health benefits of ingesting fish and the potential health risk of exposure to contaminants. Consumers may also face a dilemma between the health benefits and risk of ingesting fish versus the risk and benefits of consuming non-fish-based protein. Some fish consumers may alter this risk-risk trade-off by selectively avoiding consumption of the most contaminated fish species (e.g., higher trophic level piscivores). However, for consumers whose cultural practices and traditions revolve around consumption of just such fish species (e.g., salmon), such avoidance is simply not an option. For these consumers, this trade-off remains a zero-sum dilemma (Donatuto and Harper 2008).

To the extent that a fish advisory is part of the information that consumers use to weigh health trade-offs and make decisions, it must neither inappropriately over- or underestimate the risk associated with chemical contaminants (Foran et al. 2005). Most fish advisories in the United States are based on contamination with methylmercury, a noncarcinogenic compound (Egeland and Middaugh 1997; Cohen, Bellinger, Conner, et al. 2005). Some agencies, however, provide consumption recommendations based on potentially carcinogenic contaminants such as polychlorinated biphenyls (Reinert et al. 1991) and federal guidance provides meal recommendations based on carcinogenic endpoints with corresponding selected levels of acceptable risk (USEPA 2000b). Furthermore, academic studies that warn consumers of the cancer-causing potential of contaminated fish have received high media visibility, including recent articles proposing meal restrictions for salmon based on cancer endpoints (Hites et al. 2004; Huang et al. 2006). The question of how to balance the risk and benefits of fish consumption is complex, given the

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significant level of uncertainty in both risk and benefits. A recent review of these issues by the Institute of Medicine (NAS 2007) concluded that for most of the general population, following the current dietary guidelines provides a reasonable balance of risk and benefits associated with seafood consumption. Except in the specific instance where risk is defined as a carcinogenic endpoint with upward of a 10^{-6} probability of occurrence, we agree with these conclusions. However, unless the meaning of what are policy-based “acceptable” risk levels (c.f., Kelly 1995) is clearly acknowledged and understood, the public may respond in alarm and confusion, when, in fact, the actuality of an adverse health outcome may be exceedingly small (Barron et al. 1994; Lee et al. 2005).

ARGUMENTS

We considered whether restrictive consumption limits, predicated on the probability of developing cancer, are an appropriate basis for dissuading the public from consuming fish. We argue that cancer risk is an inappropriate basis for fish consumption advisories for 3 principal reasons. First, the acceptable excess cancer risk among U.S. regulatory agencies is typically minute, ranging from 1×10^{-4} to 1×10^{-6} additional excess lifetime cancers, relative to the probability of demonstrated benefits attributable to fish consumption. Our fundamental argument here is that the demonstrable benefits of fish consumption should be balanced against “real” (i.e., a future negative outcome with a high probability of actual occurrence) risk. That this risk is based on an endpoint (cancer) dreaded by the lay public only exacerbates the public’s aversion to fish consumption, with a subsequent loss of health benefits. Second, the extrapolation models typically used to calculate the probability of low-dose cancer outcomes tend to overestimate risk, typically by several orders of magnitude. Many of the cancer endpoints observed in laboratory testing have uncertain relevance to human disease, especially at the dosing levels or exposure routes administered to test animals. The methods used to model cancer risk based on these dose-response tests tend to be overly conservative for situations in which health benefits are much more probable than realization of risk. Third, policy decisions have dictated an extremely low acceptable excess lifetime cancer risk that may have the unintended consequence of consistently elevating cancer risk above all other health concerns. This possibility, combined with the public’s real and perceived concerns about cancer, can overwhelm any objective discussion of risk versus benefits.

CALCULATED RISK VERSUS PROBABLE BENEFITS

With respect to the relative probability of the benefits and risk attributable to fish consumption, consider the simple case of a health benefit X (with an occurrence probability $p[B]$), a cancer health outcome Y (with an occurrence probability $p[C]$) and a noncancer health outcome Z (with an occurrence probability $p[NC]$), so that an advisory would be recommended only when $(Xp[B]) - (Yp[C] + Zp[NC]) \leq 0$ (this equation is only illustrative; Ginsberg and Toal (2009) offer a quantitative approach to risk-benefit calculations involving fish consumption). It is evident that, if $p[C]$ is at or below 1×10^{-6} , or even raised higher, to 1×10^{-4} for example, that the relevance of cancer to other outcomes will be de minimis if either $p[B]$ or $p[NC]$ is of any magnitude. The acceptable range for cancer risk in U.S. regulations is typically 1×10^{-4}

to 1×10^{-6} for a lifetime excess cancer risk. This range is exceedingly small in the context of overall U.S. cancer incidence (458.2 age-adjusted cases of cancer per 100 000 people in 2004; CDC 2009). When risk is defined as an outcome with a $\leq 10^{-4}$ probability of occurrence, real health benefits are being compared with a nearly insignificant risk. Use of such a low range to issue an advisory results in consumption recommendations that are invariably more restrictive when compared with those drawn from noncancer outcomes. One might be tempted to argue that because many noncancer effects are nonfatal, $Y > Z$ in all cases. If, however, devastating but nonfatal noncancer health effects (e.g., neurobehavioral deficits in offspring from in utero exposure) occur early in life, both monetary and quality-of-life costs may be quite high and potentially irreversible. A truly meaningful comparison of relative risk, such as that between a cancer and noncancer endpoint, will ultimately require that noncancer consequences also be assessed probabilistically, rather than simply as a breach of some reference threshold (Baird et al. 1996). A recent NRC report suggests unifying the cancer and noncancerous dose-response assessment approaches to provide clearer estimates of population risk; information that is most useful for decision making, including informing risk trade-offs or cost-benefit analyses (NAS 2009). For fish consumption, while it may not be possible to state a precise value for $p[B]$, there is sufficient information to indicate the probability of a benefit is considerably greater than one chance in one million (Cohen, Bellinger, and Shaywitz 2005). Thus, our key recommendation is that real health benefits be balanced against noncancer outcomes, where the link between exposure and outcome is more robust than one in a million and where the negative perceptions associated with cancer are not part of the conversation.

CANCER EXTRAPOLATION MODELS

Several of the organic contaminants found in fish tissue have been associated with excess tumors in animal laboratory tests when exposed to sufficient doses. These lipophilic compounds include polychlorinated biphenyls (PCBs); organochlorine insecticides, such as dieldrin, chlordane, and the DDT complex; and the dioxins and furans. The majority of these compounds are classified as either probable (based on animal studies) or possible human carcinogens in the US Environmental Protection Agency’s (USEPA) fish advisory guidance (USEPA 2000b). Ideally, the evaluation of the human response to elevated contaminant levels in fish should be based on a robust process that is associated with a high degree of confidence in the methodology used, along with the underpinnings to support that methodology. We argue that the extrapolation models favored for calculating the probability of low-dose cancer outcomes from animal data overestimate risk, typically by several orders of magnitude, often with uncertain inference to human disease etiology (Gold et al. 1998) and without consideration of other influencing processes such as epigenetics (Trosko and Upham 2005).

For the prediction of cancer incidence at low doses, the observed relationship between lifetime daily dose and observed tumor incidence is fitted to a mathematical model. The traditional approach favored by EPA before the 2005 cancer guidelines was the linearized multistage model (LMS) and straight-line extrapolation. These models were used in the latest edition of the *National Guidance for Assessing Chemical Contaminant Data for Use in Fish*

Advisories (USEPA 2000b). In the LMS model, cancer slope factors are based on the upper 95% confidence limit on the coefficient of the linear term for additional cancer risk above background (Crump 1996; USEPA 1996). An important feature of the LMS and straight-line models is that the dose-response curve is linear at low doses, even if it displays nonlinear behavior in the region of interest. The generated potency factor is then used to derive a unit risk estimate—the plausible upper bound on excess lifetime risk of cancer per unit of dose. In general, these upper-bound potency measures from these models tend to overestimate risk. Sometimes this overestimate may be by several orders of magnitude and may be in the form of positive risk when the real risk is zero. There is also considerable uncertainty in the extrapolation from high to low doses, primarily because the shape of the dose-response curve at low doses is not derived from empirical observation but is inferred from theoretical considerations that cannot be directly corroborated with empirical evidence.

Recently, the USEPA outlined new guidelines to estimate carcinogenic risk that incorporated state-of-the-art science into cancer risk assessment (USEPA 2005). For chemicals that have sufficient data on mode of action, the USEPA details sophisticated options for assessing cancer, using a biologically based or case-specific dose-response approach. For chemicals without sufficient information, the recommended approach is based on a linear extrapolation to the origin, using a point of departure taken from the dose-response data, such as a LED_{10} (the lower 95% confidence limit on a dose that predicts a 10% extra risk, such as tumor incidence, over background). Regardless of whether the LMS approach or the LED_{10} point of departure model are used to estimate carcinogenic risk, the cancer slope factors generated are not substantially different from one another for most compounds (Subramaniam et al. 2006).

Additional considerations in the latest USEPA cancer risk assessment guidelines include the incorporation of human epidemiological data and characterization of compounds with a genotoxic mode of action. For genotoxic compounds, the guidelines indicate a linear-dose response should be applied. However, an expert panel asserted that this is not necessarily accurate, and nonlinear, genotoxic modes of action should be considered (Anderson et al. 2000). For many of the compounds that accumulate in fish tissue, their potential carcinogenic mode of action is unknown. Epidemiological studies in the latest guidelines are considered in the context of Bradford Hill's criteria for causality, which establishes rigorous standards to characterize epidemiological data. While human epidemiological data may be ideal in principle to guide dose-response assessment, applicable and robust data are usually limiting. This includes data that would provide a causal link between human cancer and the primary lipophilic contaminants found in fish tissue. Thus, the majority of lipophilic compounds that accumulate in fish tissue either do not have sufficient mode-of-action information, nor human epidemiological data, to use a biologically based or case-specific model. Therefore, a default linear model will likely be applied.

The adoption of linear models for regulatory purposes is based largely on a science-policy choice that emphasizes caution in the context of scientific uncertainty. Alternative models that yield lower risks or incorporate a threshold dose are plausible for many carcinogens. However, in the absence of compelling mechanistic data to support such

models, regulators are reluctant to use them, either because this would suggest that more is known about the mode of action of a carcinogenic compound than is warranted or out of concern that public perception will demand the use of the most conservative estimate. Based on all of these considerations, we argue that the bar required to justify using a nonlinear, biologically based cancer model is often too high and, therefore, cancer risk assessment should not be used for setting fish consumption advisories.

RISK PERCEPTION

Regardless of its basis, a fish advisory may lead to alterations in overall fish consumption patterns. For instance, after release of the 2001 federal advisory targeting women of child-bearing age exposed to methylmercury, a time series analysis of over 2000 pregnant women demonstrated a decline of 1.4 servings of fish per month (Oken et al. 2003). Research in the social sciences has shown that people generally will not accept a risk, such as that of cancer, which they perceive suggests serious delayed and possibly irreversible effects, even if the likelihood of occurrence is very low (Klein and Stefanek 2007). Thus invoking cancer as the basis for a fish advisory is likely to generate significant alterations in fish consumption patterns, even if the cancer risk is *de minimis*. The important difference between the actuality of cancer and the one-in-one-million chance of excess cancer is fairly abstract and very low risk estimates tend to be viewed with less credibility among the public (Johnson and Slovic 1995). Thus, it is disconcerting that "cancer" is typically invoked on the basis of this 10^{-6} chance, the genesis of which, as well as its continued use as a regulatory default, are entirely policy choices, and not scientific mandates (Kelly 1995). Reaction of the public to their perception of cancer, rather than to any meaningful chance of adverse health effects, may steer public health officials into actions that are neither particularly health protective or cost-effective. Once "cancer" enters the conversation between health officials and the public, any objective consideration of cancer risk versus fish consumption benefits may be precluded. We, therefore, argue that this potential for disproportionate negative consequences based on perception does not justify invoking the specter of "cancer," particularly given the uncertainties inherent in current potency estimation methodologies. We also note that a focus on cancer, whose consequences may not appear for decades and whose etiology can be highly uncertain, can divert attention from the potential for noncarcinogenic outcomes that are more immediately expressed and probable.

SUMMARY

Fish consumption advisories are important tools in public health, which if not properly considered, may lead to unintended adverse consequences (i.e., a loss of health benefits). We conclude that the use of carcinogenic endpoints for fish advisories is not presently justified for 3 primary reasons. First, the policy-based acceptable range for additional lifetime cancers is exceedingly small (typically 10^{-4} to 10^{-6}) compared with the clearly acknowledged health benefits associated with eating fish. Second, the methods used to estimate cancer risk are overly conservative and not justifiable in situations where health benefits are much more probable than health risk. Third, the perception of cancer by the public may result in an overall decline in fish consumption and be unproductive for public health outreach. To minimize

unintended consequences while continuing to protect public health, we advocate that risk managers derive consumption restrictions based on noncancer health outcomes only. We acknowledge that adopting this suggestion could create disparities in how state and federal programs regulate the same chemicals in differing situations (e.g., more tightly at hazardous waste sites, possibly less so for fish advisories). Yet such disparities are inherent if not all environmental problems are deemed identical or amenable to exactly the same management actions. This is why we also suggest (as has the USEPA itself) that decision makers need to 1) understand which elements of the advisory process are science and which are implicit or default policy, 2) consciously consider whether these policy elements are appropriate for their particular situation, and 3) if not, be willing to make and defend alternative policy choices. These recommendations are not particularly radical, given that the USEPA's own guidance provides flexibility and states that: "Carcinogenic toxicity has in the past often yielded the most health-conservative exposure limits, especially when coupled with a low level of 'acceptable' risk such as one in one million. Decision-makers may elect to choose a noncancer health endpoint or a less stringent level of acceptable risk..." (USEPA 2000b). What may be novel is our suggestion that cancer should not be considered in the assessment of adverse health effects from fish consumption unless detailed compound specific information is generated that warrants otherwise. Rather than attempting to estimate remote cancer outcomes, potentially carcinogenic compounds in fish should be addressed qualitatively through information on preparation and cooking recommendations to reduce exposure. To the extent practicable, advisories should be as specific as possible and targeted to a defined audience, location, and species of fish. When advisories are issued, health officials can use this visible opportunity to reiterate the benefits of a balanced diet that is rich in seafood. These efforts are less likely to result in unintended consequences and offer a refined message that addresses more probable risks while minimizing the loss of benefits.

Acknowledgment—All views of opinions expressed in this editorial are solely those of the authors and do not necessarily represent Oregon Department of Environmental Quality policy or guidance, or those of any other public or private entity. No official endorsement is implied or is to be inferred.

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From: [Newlon, Thomas A.](#)
To: [ECY RE Fish Consumption](#)
Subject: Comments on consumption rate issues
Date: Wednesday, January 18, 2012 4:31:08 PM
Attachments: [LT Andrea Matzke.pdf](#)

Dear Ecology --

I am writing to provide limited comments on the seafood consumption rate issues that Ecology is currently evaluating. My primary comment relates to the linkage between consumption rates and risk range. In the past, Ecology has recognized that a consumption rate that is more representative of what the general population consumes may be appropriately used when it is paired with a 10-6 risk level. This is because higher consumers are likely protected within the risk range recognized as protective (e.g., 10-5 to 10-6 in the Clean Water Act, and 10-4 to 10-6 in CERCLA). Ecology has opted to use the more protective end of those risk ranges in MTCA and in its water quality standard-setting efforts, but has in the past recognized that a consumption rate representative of the general population can then be used because sub-populations that consume at higher rates will still be protected within the risk range generally accepted as "safe" nationally.

The current effort related to seafood consumption rates decouples the risk range/consumption rate questions and takes as a given that 10-6 is the only acceptable risk level. This is a profoundly important decision, as it will invariably result in standards that will result in large portions of the state's waters being deemed "impaired" for water quality, and large areas of sediments being defined as unacceptably contaminated. Standards that result in a significant portion of the entire state's waters and sediments being deemed contaminated (and contaminated by a very large margin) will not result in those waters being cleaned up. In fact, the combination of a 10-6 risk level and generally using consumption rates applicable to a subset of the population will instead result in regulatory gridlock and less, rather than more, cleanup. Ecology should rethink its approach of determining risk level and consumption rates as independent exercises and return to an overall evaluation of risk that evaluates the appropriateness of different consumption rates and risk levels in tandem. I am not opposed to consumption rates that more accurately reflect use by Tribes and others; I would simply like Ecology to include an evaluation of the appropriate risk level to use at the same time as it evaluates changes to consumption rates.

I have attached a comment letter submitted to the Oregon Department of Environmental Quality when they were going through a similar exercise. The basic points made in the attached letter are pertinent to Ecology's efforts as well.

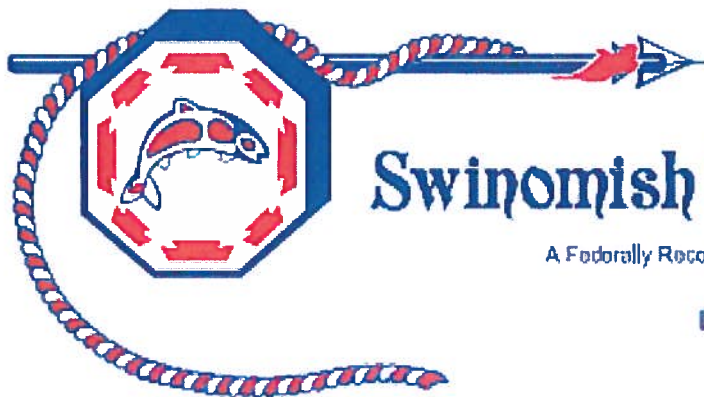
In addition to the risk level issue, it is very important that Ecology not set one default state-wide consumption rate. The circumstances involved across the state are so varied that a default consumption rate will necessarily be far off the mark for what one could reasonably expect to occur at most sites.

Thanks you for allowing for comments early in this important process. Tom

Thomas A. Newlon
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Swinomish Indian Tribal Community

A Federally Recognized Indian Tribe Organized Pursuant to 25 U.S.C. § 476

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January 17, 2012

Ted Sturdevant, Director
Washington State Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600
fishconsumption@ecy.wa.gov

RE: Comments on the Fish Consumption Rates: Technical Support Document

Dear Director Sturdevant: *Ted*

Thank you providing a copy of the Washington State Department of Ecology's document, *Fish Consumption Rates: Technical Support Document* (publication #11-09-050; referred to as the "FCR document" in this letter). The report is well-researched and well-written. We appreciate the effort to thoroughly and accurately document the importance of fish consumption, not only to Tribes, but to all people of Washington State. The following comments are provided in hopes of strengthening the defensibility of the report for its use in revising Washington State rules and regulations.

The proposed rate increase reflects current Washington State resident fish consumption, not tribal-specific consumption

The Swinomish Indian Tribal Community ("Swinomish") strongly supports increasing the fish consumption rate used in Washington State regulations. The current 6.5 grams per day ("gpd") rate is a gross underestimate of all Washington State residents who eat fish (the term "fish" includes all marine, freshwater and anadromous species and shellfish), as demonstrated in the data reviewed in the FCR document. Such a low rate does not adequately protect the health of any fish-consuming person.

However, it must be clearly stated that while the suggested rate increase of 157-267 gpd may adequately protect many Washington residents (provided that all of the other factors used in the risk assessment calculations maintain the same stringency/ are not relaxed), these rates will not be protective of many tribal members, who currently consume much more fish. Although Swinomish has yet to complete our seafood diet study, the Suquamish Tribe's numbers provide apt figures—only the 75th percentile of Suquamish tribal members are protected using the 267gpd rate (keeping in mind that reasonable maximum exposure is considered protective at 90-95 percent of the population distribution). Swinomish cannot endorse inadequate protection—all tribal members have a right to be protected at the level of fish they consume (not just as a human right but also a Treaty right, c.f., O'Neill 2007).

Moreover, current tribal rates are suppressed, as briefly discussed in the FCR document (p. 96). Therefore, implying that even the highest of the suggested rates—267gpd—is protective of tribal peoples is not correct. If increasing the fish consumption rate means having to choose a number that only lies within the range of 157-267 gpd, then Oregon's precedent of 175 gpd is the lowest rate that can be considered sufficient in better protecting the health of all Washington State residents (as long as all other factors in the risk assessment remain unchanged). During the next review cycle, tribes will push for higher fish consumption rates that are more reflective of tribal practices.

Risk assessment and exposure assessment factors

While we understand that the FCR document focuses solely on one component of the risk equation—exposure via ingestion—no fish consumption rates can be endorsed unless all of the factors in the risk equation are explicitly stated up front. We want to ensure that none of the other factors are relaxed or adjusted such as to be not as protective of human health. For example, there has been some discussion about changing the “acceptable” cancer risk level --upping risk levels to 10^{-5} or 10^{-4} ; this is simply unacceptable. Not only does it render increasing the fish consumption rate moot, it sends a very clear message to Washington State residents that our health and welfare are not driving factors in setting regulations.

Equally disconcerting are the discussions regarding setting compliance schedules to be 40+ years instead of the current 10 years, and considering use of a fish diet fraction of less than 100%; both ideas would destroy all the advances made in protecting human health with increased fish consumption rates.

Salmon must be included in the fish consumption rates

When assessing fish consumption rates, the entire “fish basket” must be included so that the total rate equals all of the types of fish eaten. This is important for all Washington State residents because when one species is unavailable, many people substitute by eating other species in greater quantities such that their overall consumption rate remains the same. If salmon is the species being substituted and it is not accounted for, people may not be protected to an adequate degree if they consume substitute species.

For tribes, the issue of salmon carries a different importance. Substitution is often not an option; tribal members may eat fish even if they are contaminated because of the cultural importance of those species (Donatuto, Satterfield and Gregory 2011). Salmon is an excellent example-- salmon is a cultural keystone species sacred to tribal people (Garibaldi and Turner 2004) and tribes have Treaty-protected rights to harvest and consume salmon. Tribal salmon consumption may currently be suppressed due to a devastating reduction in salmon run sizes attributable to pollution and environmental degradation of fish habitat (*see, for example*, the recent ruling of Phase II of *United*

States v. Washington, also referred to as the “culvert case”), but were salmon more plentiful, tribes would be able to harvest, and eat, more salmon.

Habitat quality and site-specific fish consumption rates

Treaty rights also play a key role in determining that we cannot support use of the EPA Region X Framework (discussed on page 78 of the FCR document). In the EPA framework, the habitat quality is categorized by two tribes—Tulalip Tribes’ lower shellfish consumption, presumably due to lower quality and quantity of habitat, and Suquamish Tribe’s higher shellfish consumption rates based on higher quality and quantity shellfish habitat. Yet treaty rights protect shellfish use for tribes no matter what their current consumption level and no matter what their current habitat quantity and quality; therefore assuming that Tulalip and Suquamish would have different levels of consumption even with similar habitat is incorrect. Many tribal people would like to eat more fish than they currently do (Donatuto and Satterfield, unpublished). Using the EPA Region X framework’s habitat determination and categorizing any tribe as having lower quality and quantity of habitat sets the clean up to a lesser standard than what treaty rights protect, essentially pigeon-holing tribes into a downward spiral of habitat quality and quantity and undermining tribes’ ability to return to heritage consumption rates in the future.

Although the FCR document contains a section on site-specific fish consumption rates, Swinomish would like to see explicit wording allowing individual tribes to set consumption rates at levels that reflect their own consumption levels, and not be forced to use a state-wide default that is not be protective of tribal people who harvest in the same areas over a lifetime.

Beyond the FCR document—the regulatory context for using fish consumption rates

As it currently stands, the water quality standards (“WQS”) revisions are on hold, as are the MTCA revisions, leaving only the sediment management standard (“SMS”) revisions on the table. While fish consumption rates are part of both the MTCA and WQS rules, they are not explicitly part of the SMS. In fact, the SMS contain no details regarding guidance of what is protective of human health. Therefore, while the FCR document is an important document in cataloging current rates of Washington State residents, and demonstrating that 6.5 gpd in the WQS and 54 gpd (and 50% diet fraction) in the MTCA are both inadequate, it is unclear to us what will become of these insights in regards to the rules’ revisions. We do not want to see the fish consumption rate issue buried. Ideally, there should be a detailed human health component in the SMS, but barring that, we want assurances that the work presented in the FCR document will be employed when the WQS and MTCA rule revisions are placed on the table. We want to see specific timelines from Ecology regarding revisions for each of the rules as well as substantial steps taken to keep this document alive. We do not want to see all of the hard

Ted Sturdevant, Director
January 17, 2012
Page Four

work put into the FCR document simply become an Ecology exercise in time and resource use.

We look forward to the continued move forward toward revising the fish consumption rate to be more protective of human health in Washington State.

Sincerely,



M. Brian Cladoosby, Chairman

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VIA E-Mail

January 18, 2012

Mr. Ted Sturdevant
Director, Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

RE: Nippon Paper comments on Ecology's *"Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington,"* Publication No. 11-09-050

Dear Director Sturdevant:

FCR is complex and this will be a significant change in Washington. This TSD will become the basis for rulemaking in the Sediment Management Standards and in the Surface Water Quality Standards. Therefore we urge Ecology to be considerate and responsive to comments made on the TSD.

No doubt this will be a Significant Legislative Rule (SLR) (RCW 34.05.328) and require careful adherence to the elements necessary for promulgation of an SLR.

Technical Comments

1. Nippon endorses the comments submitted by NCASI dated January 11, 2012 on the FCR/TSD.
2. Inherent conservatism applied throughout risk models and methods used to determine sediment cleanup requirements and water quality standards make use of a high FCR unnecessary. See the report titled "Evaluation of the Fish Consumption Rate....." dated May 2003 by AMEC which is attached. The conservatism applied throughout the fish ingestion survey process and the ultimate human health risk analysis make selection of a FCR in the range of 157 to 267 grams per day (g/day) an excessive value for use in state wide cleanup decisions or water quality.
3. At many, if not all cleanup sites in Puget Sound, sediment PCB and dioxin concentrations would exceed cleanup criteria derived based on the current Model Toxics Control Act (MTCA) default fish consumption rate of 54 g/day. In fact, as noted by Jim West of Washington Department of

Fish and Wildlife in his presentation at Ecology's Technical Workshop on Fish Consumption, most Puget Sound fish included in the State monitoring program have PCB concentrations above a fish tissue PCB criterion based on even the 1980 AWQC fish consumption rate of 6.5 g/day (70% of English sole, 90% of coho, and 100% of Chinook and herring).¹ More than 50% of freshwater fish in the state would exceed such a criterion. Virtually all fish in State waters would exceed a PCB fish tissue criterion based on the current MTCA default fish consumption rate of 54 g/day and, by extension, virtually all sediments in State waters would exceed a PCB criterion based on the MTCA default fish consumption rate. Therefore, cleanup levels at these sites would default to background.

However, defining background for these chemicals provides a significant challenge to Ecology. This will require additional regional or site specific analyses that will be difficult and costly to perform. In addition, MTCA defines the site boundaries (WAC 173-204-560 (4)(b)(i)) to include those areas where the individual contaminants exceed the applicable sediment quality standards as defined in WAC 173-204-320 through 340. This includes chemical and biological criteria. If we establish background as the cleanup level for these chemicals then the definition of a site boundary becomes even more difficult.

A discussion should be provided in Chapter 7 regarding the impact that fish consumption rates have on the establishment of site cleanup criteria to background levels and the impact this has on developing site boundaries.

4. Chapter 3. Measures of Technical Feasibility, page 43.

Ecology addresses in a general manner the technical appropriateness of the fish consumption studies it relied on. This section of the TSD topically addresses what elements go into a technically correct study but the TSD does not cite or describe any results of a thorough review (e.g. peer review) of high consumer fish consumption studies.

5. Chapter 4. Fish Consumption Survey Data

This chapter identifies which studies Ecology believes provide a sound basis for establishing a new FCR. The studies should be provided in whole and with supporting data so that they are assessable to the public for review and analysis.

Policy and Regulatory

1. The application of a default FCR for the entire State of Washington in the range of 157 to 267 g/day is based on a small select group of high consumers. It is unlikely this high default value will serve to reduce actual contributing pollutant levels in sediments or fish tissue. Existing rules already drive sediment cleanups lower than is achievable in most cases because of the limits of

¹ Washington Department of Ecology technical workshop on fish consumption in Washington, December 12, 2011, University of Washington South Campus Center, Seattle.

technology, funding, and the high likelihood of recontamination due to stormwater runoff and a whole host of anthropogenic causes.

Higher FCR's should be applied where they are needed to protect actual consumers and on a case by case basis as is already enabled by current regulations. Applying a higher FCR state wide will likely produce numerous unachievable results that will serve no practical purpose for the regulated community or the agency. The long term goal already in place for improving Puget Sound and reducing contaminants will not be hurried along by setting this new FCR.

Any application of the revised FCR to water quality standards must be accompanied by a set of tools that allow dischargers to be in compliance. These tools should consider both the regulatory methods allowable by EPA as bona fide compliance pathways and the likely technical and economic methods available to treat discharges to extremely low levels. Without a clear path forward municipal and industrial dischargers will be out of compliance immediately because discharge levels of certain pollutants will be driven to near zero by the high FCR.

The TSD lacks a specific discussion on the potential changes to actual risk for state wide or high consumers because of the higher FCR. While the change in FCR may fulfill legal or policy objectives the *actual* risks presently experienced in the state due to fish consumption may not change for a very long time. Quantification of the *actual* risk change due to the proposed FCR should be addressed.

If current regulations are difficult to achieve will superimposing additional requirements result in any real improvement to water quality?² The question begs an answer that deals with much broader efforts towards pollution reduction that involves infrastructure (stormwater control) and product toxics (pollutant input) requiring huge financial resources to achieve.

Sincerely,

Paul F. Perlwitz
Environmental Manager

² Technical Support Document, page 110 "Water quality criteria based on human health provide long-term water-body based goals, and even current values are difficult to achieve."

**Evaluation Of The Fish Consumption Rate Selected By Oregon DEQ
For The Development Of Ambient Water Quality Criteria**

Submitted to

Northwest Pulp and Paper Association
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May, 2003

EVALUATION OF THE FISH CONSUMPTION RATE SELECTED BY OREGON DEQ FOR THE DEVELOPMENT OF AMBIENT WATER QUALITY CRITERIA

Oregon DEQ has proposed that a fish consumption rate of 17.5 g/day be used to establish Ambient Water Quality Criteria (AWQC) for Oregon's fresh waters. This consumption rate is an estimate of the 90th percentile per capita rate of consumption of freshwater and estuarine finfish and shellfish by the general population of United States, based on the USDA's CSFII data. It is recommended by EPA (2000) as a default fish consumption rate to represent the consumption of fish by the general population and sport anglers when deriving AWQC. Its selection as the basis for AWQC in Oregon is very conservative for several reasons. First, the data upon which it is based are not representative of the population of interest in that they include many types of prepackaged and imported fish that are not derived from local water bodies. Second, the use of short-term dietary recall data to estimate long term consumption rates for any population results in biased and high uncertain estimates. Finally, the conservatism in the selected fish consumption rate, along the numerous other conservative assumptions included in the derivation of the AWQC, ensures that the AWQC will be protective of high-end consumers.

Estimated Consumption Rates Based on USDA Data Are Highly Uncertain

Consumption rates that are based on USDA dietary data are highly conservative when applied to Oregon's AWQC methodology for a number of reasons. First, the data collected are not focused on the population of interest, i.e., individuals who consume freshwater fish from Oregon's ambient waters, and include many other types of fish. Second, the USDA rates, which are based on short-term dietary recall data collected from the general population of the U.S., overestimate long-term consumption for high-end consumers and underestimate it for "non-consumers", resulting in a high level of uncertainty in the estimates. However, available data can be used to evaluate the validity of the specific assumption of 17.5 g/day that is being proposed by DEQ.

Population of Interest for AWQC

The population of interest for the development of Oregon's AWQC are those individuals who consume freshwater fish obtained from Oregon's ambient waters. These include members of the general population of Oregon who purchase freshwater fish that has been obtained from commercial freshwater fishing sources in the state, sport anglers who catch their own fish, and Native American tribes who obtain fish through their commercial or recreational activities. The USDA data do not provide specific information about recreational or Native American populations. In addition, while EPA (2000) reports the results of USDA survey for consumers among the general population, it is not representative of all consumers within the population and does not provide information about freshwater fish only. Instead, results are presented for "freshwater/estuarine" fish and shellfish, which include many species and meals of fish that would not be found in the water bodies that will be subject to the AWQC. Furthermore, the USDA data include fish meals that are obtained from numerous sources. These include fresh, frozen and canned fish products that have been produced in other regions of the United States or imported from other countries and are not derived from local water bodies. Thus the USDA data overestimate the consumption of locally caught fish and certainly overstate consumption from individual water bodies that are regulated under the AWQC.

Limitations of the Use of Short-Term Dietary Data for the General Population

The USDA dietary data do not provide a strong basis for estimating a long-term fish consumption rate to be used in developing the AWQC because of the way that the data were collected. This is particularly problematic when one attempts to use them to estimate high-end consumption rates.

The USDA dietary data were collected from survey participants during two non-consecutive 24-hour periods (EPA, 2000). Because of the way in which sampling was conducted, the actual fish consumption behaviors reported are strongly biased toward those respondents who consume fish with a high frequency. All of the individuals included as fish consumers in the USDA estimate consumed fish at least once during the 2-day sampling period. To use these data to estimate long-term consumption rates, it is necessary to assume that the consumption behavior that occurred during the 2-day period is the same as the consumption behavior that occurs throughout every other 2-day period during the year. Thus, if an individual reported eating one fish meal during the sampling period, the extrapolation necessary to estimate long-term consumption requires the assumption that the individual continues to eat fish with a frequency of once every two days, or as many as 183 meals per year. If it is assumed that an individual eats one-half pound (227 g) of fish per meal, this results in a consumption rate of 114 g/day. However, the individual who consumed fish during that sampling period may not actually be a regular fish consumer. In fact, that fish meal could have been the only fish meal that the individual consumed in an entire year. Thus, that person's fish consumption rate would be substantially overestimated. Unfortunately, because of the way that the USDA data are collected, there is no way to determine if the behaviors reported by survey respondents during the sampling period are representative of their long-term behaviors. Thus, for the "consumers" in the population who were reported in these data, the reported consumption rates must have a minimum of one meal every two days.

Conversely, individuals who did not consume fish during the 2-day sampling period were assumed to be non-consumers of fish when instead those individuals may have been fish consumers who coincidentally did not consume fish during the 2-day sampling period. Because there are no data upon which to base consumption estimates for these individuals, they must be assumed to consume 0 g/day. However, they may in fact consume fish with a frequency ranging from as little as zero meals per year to as much as one meal per day (or even more than one meal per day) on all days except the two that USDA conducted the survey. As with the high consumers identified in the USDA database, there is no way to determine whether 0 g/day consumers are actually non-consumers or just individuals who consume with less frequency than once every two days.

To demonstrate the effect that length of sampling period can have on resulting fish consumption rates, one can compare the findings of other short-term dietary studies with long-term studies. For example, another USDA survey reported by Mertz and Kelsay (1984) asked 29 people to track the types and amounts of food they ate for a one-year period. Because the daily dietary records kept by the study subjects can be condensed into 52 discrete one-week periods, it is possible to investigate the relationship between annual and weekly average fish consumption rates. The mean yearlong fish consumption rate from the Mertz and Kelsay (1984) survey data can be estimated by summing the entire quantity of fish consumed by each survey respondent during the year and dividing by 365 days. The mean per capita "365-day" fish consumption rate developed using this approach is 26 g/day. In addition, the mean daily fish consumption rate

averaged over a one-week period, the "7-day" fish consumption rate, is estimated to be 26 g/day. Thus, the mean per capita consumption rate does not appear to be affected substantially by the recall period, suggesting that the per capita mean is a fairly robust and meaningful measure of the average consumption rate, regardless of the length of the survey period.

The same cannot be said, however, of the upper percentiles of the fish consumption rate distribution. When comparing the 7-day intake rates collected by Mertz and Kelsay (1984) with the 365-day intake rates, the upper percentiles are very different. For example, when looking at the 7-day intake rates, the maximum value reported is 228 g/day. However, when the 365-day averages are developed, by combining all of the 7-day periods throughout the year, the maximum consumption rate is 78 g/day. Thus, the short-term estimate overstates the actual long-term maximum by a factor of three. Similarly, when comparing the 95th percentiles reported for these two periods, the 7-day daily average (87.71 g/day) substantially overestimates the 365-day daily average (51.13 g/day) by 72 percent, again demonstrating that the 7-day recall period does not provide a reliable surrogate for long-term consumption behavior at the upper end of the distribution. It is very likely that extrapolating results from a 2-day sampling period would further overestimate long-term behavior.

This problem has also been demonstrated and discussed by Ebert et al. (1994) who compared reported rates of self-caught fish consumption based on the duration of the recall period. Ebert et al. reported that when a one-day recall period was used by Pierce et al. (1981) and Puffer et al. (1981), "high-end" (95th percentile) intakes ranged up to 339 g/day for consumers. When Pao et al. (1982) used a 3-day recall period, the 95th percentile intake for consumers was reported to be 128 g/day. Using a 30-day recall period, Javitz (1980) reported a 95th percentile intake of 42 g/day, and when a recall period of one year (365 days) was used (Fiore et al., 1989; Ebert et al., 1993), the 95th percentile estimates for sport-caught fish consumers ranged from 26 to 37 g/day.

EPA (1997; 1998a, p. 108) has acknowledged that short-term dietary records are problematic when attempting to estimate long-term rates of consumption. In its review of fish consumption studies for the *Exposure Factors Handbook*, EPA (1997, p. 10-13) stated, "the distribution of average daily intake reflective of long-term consumption patterns cannot in general be estimated using short-term (e.g., one week) data." Specifically in its discussion of the limitations of the West et al. (1993) study of Michigan sport anglers, which used a one-week recall period, EPA (1997 pp. 10-16 to 10-17) stated that "since this survey only measured fish consumption over a short (one week) interval, the resulting distribution will not be indicative of the long-term fish consumption distribution and the upper percentiles reported from the EPA analysis will likely considerably overestimate the corresponding long term percentiles. The overall 95th percentile calculated by U.S. EPA (1995) was 77.9; this is about double the 95th percentile estimated using year long consumption data from the 1989 Michigan survey." In addition, when discussing the USDA methodology, EPA (1998a, p. 106-107) stated that "[t]he non-consumption of finfish or shellfish by a majority of individuals, combined with consumption data from high-end consumers, resulted in a wide range of observed fish consumption. This range of fish consumption data would tend to produce distributions of fish consumption with larger variances than would be associated with a longer survey period, such as 30 days."

While the USDA data are associated with a high level of uncertainty due to the substantial biases introduced by the use of short-term dietary data, the evaluation of the work by Mertz and Kelsey, indicates that the arithmetic mean "per capita" estimate of 17.5 g/day, being proposed

by DEQ, is a conservative but supportable estimate of consumption by the target population. In addition, a review of longer term and more relevant data indicates that the proposed rate of 17.5 g/day is reasonable for use in developing Oregon's AWQC.

In the results provided by Rupp et al., average consumption rates over the entire population were provided along with the numbers of surveyed individuals who actually consumed each type of fish in each region. According to Rupp et al. (1980), a total of 2,141 adults were surveyed in the Pacific region, which includes Washington, Oregon, California, Alaska and Hawaii. The surveyed individuals consumed an average of 0.39 kg/year of freshwater finfish over the year. Of those, 14.1 percent (300 individuals) were "consumers" of these fish. Considering the total population surveyed, it appears that 835 kg of freshwater finfish were consumed ($2,141 \text{ persons} \times 0.39 \text{ kg/person-year} = 835 \text{ kg/year}$). If this total amount of fish consumed is divided equally among the 300 individuals who actually consumed the fish, the result is an average of 2.8 kg of fish per consumer per year. On an annualized daily basis, this equates to an average of 7.6 g/day for each consumer. Similarly, the average rate of shellfish consumption by those 2,141 persons was 1.48 kg/year, for a total of 3,169 kg/year. Of the individuals surveyed, 49.2 percent were consumers. Dividing the total amount of shellfish consumed by the number of actual consumers results in an average daily fish consumption rate of 3.0 kg/year or 8.2 g/day. Combining the average finfish and shellfish consumption rates results in a combined consumption rate of 15.8 g/day. Because of the length of the recall period (1-month), these estimates can be considered more reliable than rates based on the USDA data. In addition, this estimate is more relevant to one of the populations of interest in Oregon (i.e., freshwater fish consumers within the general population of the state). These results indicate that the 17.5 g/day estimate proposed by DEQ is a reasonable surrogate.

EPA's (2000) methodology for the development of AWQC recommends that, when available, consumption rates for populations of concern should be drawn from local or regional survey data. Given that sport anglers are one group of fish consumers that are most likely to consume a large portion of their fish from a single watershed, it is appropriate to select a fish consumption rate that is protective of this subpopulation.

EPA's (1998a) Technical Support Document for AWQC derivation provides a summary of fish intake rates by sport anglers from different regions of the country. Among those there were two studies of Columbia River anglers in Washington State. Average consumption rates for these two studies ranged from 1.8 to 7.7 g/day.

After its review of the available sport-caught fish consumption data, EPA (1997) recommended fish consumption rates for freshwater recreational anglers. The average consumption rates recommended 5 g/day, based on both the Ebert et al. (1992) and Connelly et al. (1996) studies, 12 g/day (West et al., 1989) and 17 g/day (West et al., 1993). The upper percentiles recommended were 13 g/day (a 95th percentile based on a one-year recall survey by Ebert et al. 1993), 18 g/day (a 95th percentile based on a one year recall survey by Connelly et al., 1996) and 39 g/day (a 96th percentile based on a one-week survey conducted by West et al., 1989, which was extrapolated to long-term consumption using general questions about consumption during the remainder of the year). No upper percentile value was reported for the West et al. (1993) study because EPA (1997) recognized that the upper percentile value was unreliable and likely overstated due to the short length of the recall period, as discussed previously. It is likely that the rates reported by Ebert et al. (1993) and Connelly et al. (1996) are more reliable estimates of long-term consumption as they are based on long-term data. In addition, the West

et al. (1989) estimate included fish from commercial as well as recreational sources. According to West et al. (1989), 39 percent of the fish consumed by Michigan anglers were sport-caught fish. If one applies this percentage to the mean and 96th percentile of the West et al. study, the results are 5 g/day and 15 g/day, respectively, for consumption of sport-caught fish only. These results are very consistent with the rates reported for recreationally-caught fish by Ebert et al. (1993) and Connelly et al. (1996) and also support DEQ's proposed conservative default value of 17.5 g/day..

Use of the 17.5 g/day Consumption Rate, Along with Other Conservative Assumptions, Results in Highly Protective AWQC

AWQC are used as environmental benchmarks and as objectives in the development of environmental permits. While they are applicable to all ambient waters in Oregon, they are most often considered for individual water bodies when Oregon DEQ is developing permitting and effluent limits. Thus assumptions that are already judged and selected to be conservative when one is attempting to develop statewide criteria, become extremely conservative when considering individual water bodies.

In light of the way in which AWQC are applied in permitting, the approach used to develop AWQC includes a number of highly conservative assumptions, particularly for constituents that are limited and localized. The conservative assumptions used in the development of AWQC in Oregon include:

- o The fish consumption rates include the combined consumption of freshwater and estuarine fish and shellfish;
- o 100 percent of the fish consumed are assumed to be from a single water body;
- o Fish are consumed by individuals every year for 70 years;
- o No loss of compounds occurs due to cooking or preparation methods;
- o Concentrations of compounds in fish are in equilibrium with compound concentrations in the water body; and,
- o The allowable risk level is one in one million (10^{-6}).

Inclusion of Freshwater and Estuarine Fish and Shellfish

In developing AWQC, the fish consumption rates that are used include the ingestion of freshwater and estuarine finfish and shellfish. This is because AWQC need to be applied to a number of different types of water bodies throughout the state. However, this assumption is very conservative when one considers permitting of individual discharges that occur in specific areas of individual water bodies and usually affect either freshwater or estuarine areas, not both. If there is a permitted discharge to a freshwater body, the consumption of estuarine fish and shellfish is likely to be irrelevant. Similarly, if there is a discharge to an estuarine area, the freshwater fish upstream will likely not be affected. Thus, inclusion of rates of consumption of freshwater and estuarine finfish and shellfish is a very conservative assumption for these specific applications.

As discussed previously, the Rupp et al. (1980) analysis of fish consumption in the Pacific region indicated that the average rate of shellfish consumption by consumers was 8.2 g/day and the average rate of freshwater fish consumption by consumers was 7.6 g/day. Thus, when considering the application of AWQC to freshwater bodies, where shellfish are not likely to be

consumed, consumption will be overestimated by more than a factor of two when a combined consumption rate is used.

Assumption that 100 Percent of Fish Are From a Single Water Body

When the AWQC are applied for permitting, it is implicitly assumed that all fish are consumed from a single water body. This is a very conservative assumption for most of the water bodies that receive discharges.

In all of the key studies of recreational anglers discussed by EPA (1997), the consumption rates represented the total amount of sport-caught fish consumed by the survey respondents. The fish were obtained from a number of fisheries and thus generally overestimated consumption from single water bodies. The approach used to develop the AWQC assumes that the vast majority of the population consumes all of their fish from a single source. This is not likely to be the case for most water bodies.

Assumption of Equilibrium

The AWQC approach uses a factor for bioaccumulation. That factor assumes that the concentrations of constituents in fish are in equilibrium with constituent concentrations in the water body of interest. This is not likely to be the case for the most popular fish species harvested. According to the CRITFC (1994), the species of fish consumed most often by Columbia River tribal members were anadromous species (salmon, trout, lamprey and smelt), with the average rate of consumption for anadromous species nearly three times higher than the rates of consumption of resident species. Most anadromous species spend only a small fraction of their lifetime in the Columbia River. For example, after hatching, juvenile Chinook salmon spend several months in the river before they begin their out-migration to marine feeding areas. They generally return to the river to spawn between the ages of two and six years (ODFW, 1989) and do not generally feed during their spawning run. Thus these fish, which provide a substantial portion of the freshwater fish harvested both commercially and recreationally from the river, are clearly not at equilibrium with their surroundings. These migratory fish can spend much of their time in portions of the river not affected by discharges and only "pass through" river reaches that have discharges and associated higher concentrations of regulated compounds. Because of this exposure to varying concentrations of regulated compounds, migrating fish likely do not spend adequate time in a particular reach to achieve equilibrium with concentrations in the water column and, hence, have lower concentrations of a regulated compound than assumed by the AWQC. Thus, the AWQC likely overestimates the resulting tissue concentrations in such fish.

Duration of Consumption

The AWQC calculation assumes that individuals consume fish from a single source every year of their lives for 70 years. This assumption is highly conservative. Individuals are likely to move many times during their lifetimes and, as a result of those moves, may change their fishing locations and thus the sources of the fish they consume. In addition, it is likely that most anglers will not fish every year of their lives. Health issues and other demands, like work and family obligations, will likely result in no fishing activities or reduced fishing activities during certain periods of time that they live in a given area. Thus, to assume that an individual

consumes all fish from a single water body, every year throughout his/her lifetime is certainly a conservative and protective assumption that adds an additional level of protection to the AWQC.

Cooking and Preparation Loss

The AWQC does not account for the fact that levels of many contaminants, especially the lipophilic constituents like PCBs and dioxins and furans, are substantially reduced when individuals prepare and cook their fish. Thus for these constituents, the assumption that there is no loss due to cooking and preparation provides an additional level of protection to the AWQC.

Risk Level

In the EPA (2000, p. 2-6) methodology document, it is clear that the States and Tribes have the discretion to establish risk levels and to consider subpopulations of interest and concern. It states that "EPA believes that both 10^{-6} and 10^{-5} may be acceptable for the general population and that highly exposed populations should not exceed a 10^{-4} risk level." It goes on to say that "if the State or Tribe determines that a highly exposed population is at greater risk and would not be adequately protected by criteria based on the general population and by the national 304(a) criteria in particular, EPA recommends that the State or Tribe adopt more stringent criteria using alternative exposure assumptions" (EPA, 2000; p. 2-2). Furthermore, it states that "[I]n cases where fish consumption among highly exposed population groups is of a magnitude that a 10^{-4} risk level would be exceeded, a more protective risk level should be chosen." (EPA, 2000; p. 2-6)

Oregon DEQ is planning to use a one in a 10^{-6} risk level as the basis for the AWQC. This is at the conservative end of EPA's (2000) recommended risk range of 10^{-5} to 10^{-6} for the general population. Also discussed in the methodology document is the fact that subpopulations of concern should not be at a risk greater than 10^{-4} . If a 10^{-4} risk level is used to evaluate potential sensitive subpopulations, then these individuals could consume 100 times more fish than the general population of the state (which is being evaluated using a 10^{-6} risk level) and still be within acceptable exposure levels.

Oregon DEQ has proposed the use of a consumption rate of 17.5 g/day to protect the general population of Oregon and its recreational anglers. Higher-level consumers could consume 100 times that amount, or 1,750 g/day every day and still not exceed the benchmark level of 10^{-4} established by EPA (2000) for high consuming subpopulations.

According to data collected by the Columbia River Intertribal Fish Commission (CRITFC, 1994), the average rate of consumption for the Columbia River tribes was 58.7 g/day and the 95th percentile consumption rate was 170 g/day (EPA, 1997). This is well below the allowable consumption rate of 1,750 g/day associated with the 10^{-4} risk level, as discussed above, and is also below the consumption rate associated with the 10^{-5} risk level. Even if the maximum value reported from the CRITFC (1994) survey, 972 g/day, is considered, risks will still be well below the benchmark of 10^{-4} that has been recommended by EPA (2000) for highly exposed subpopulations.

The CRITFC (1994) data are consistent with other data for subsistence populations. In Table 2.3.9 of its *Ambient Water Quality Criteria Derivation Methodology Human Health Technical Support Document* (EPA, 1998a), EPA summarizes seven studies of subsistence

populations (Kmiecik, 1994; CRITFC, 1994; Degner et al., 1994; Hovinga, 1992-1993; EPA, 1992; Peterson et al., 1995; and Nobmann et al., 1992). While EPA (1998a) reported that the mean fish intake rates reported for those studies ranged from 23 to 351 g/day, the highest value, which was reported by Kmiecik (1994), was based on a personal communication, not a published or peer-reviewed study. Thus the methodology behind it and its reliability as an estimate of consumption cannot be established. (It should be noted that when EPA reviewed subsistence studies for its 1997 *Exposure Factors Handbook*, this study was not included.) If one eliminates the mean consumption rate presented by Kmiecik (1994), the range of mean intake rates from the six remaining studies is 23 to 109 g/day, with an average of 56 g/day. This is very similar to the average rate of 58.7 g/day reported by CRITFC (1994) for all tribal members surveyed.

This indicates that the use of a default fish consumption rate of 17.5 g/day, as is being proposed by Oregon DEQ, is also protective of the Columbia River tribes. The 95th percentile consumption rate reported by CRITFC for that population is approximately associated with a risk level of 10^{-5} and thus falls at about the mid-point of the EPA's acceptable risk range. Based on EPA's (1998a) evaluation of other studies of subsistence populations, this consumption rate also appears to be protective of any other potential subsistence populations that may be consuming fish from Oregon waters.

Summary and Recommendation

Oregon DEQ is proposing to revise its AWQC using a fish consumption rate of 17.5 g/day, based on USDA short-term dietary data. While a high level of uncertainty is associated with these data, the selected consumption rate appears to be a reasonable and conservative default when compared with other relevant consumption data.

Use of this consumption rate for the general and recreational population is very conservative when the AWQC is applied to the permitting of discharge limits. The AWQC approach is based on a 10^{-6} risk level, which is very protective of the entire state of Oregon and is likely to be overly protective of the much smaller populations that obtain fish from individual water bodies. In addition, the approach assumes that all freshwater finfish and shellfish consumed throughout a lifetime are obtained from a single water body and that there is no reduction of contaminant levels due to cooking and preparation methods. There are a very small number of individuals, if any, to whom such conservative assumptions would apply.

EPA (2000) has based its national AWQC on a 10^{-6} risk level. It also supports use of a 10^{-5} risk level when States or Tribes are establishing AWQC. EPA (2000) "also believes that criteria based on a 10^{-5} risk level are acceptable for the general population as long as States and Authorized Tribes ensure that the risk to more highly exposed subgroups (sport or subsistence anglers) does not exceed the 10^{-4} level." (EPA 2000; p. 1-12) Thus, the critical issue to consider is whether the use of a consumption rate of 17.5 g/day for the general population of Oregon is also protective for subpopulations of high consumers.

Based on EPA's recommended risk range and available fish consumption data, this consumption rate is also protective of recreational anglers and the Columbia River tribes. The proposed rate of 17.5 g/day (at a 10^{-6} risk level) can be increased by 100 times, to a rate of 1,750 g/day and still be within EPA's acceptable risk limit of 10^{-4} . Local and regional fish consumption data indicate that this consumption rate is substantially higher than even the

maximum fish consumption rate reported for the Native American population (CRITFC, 1994) and is also higher than the rates reported for other fish consuming subpopulations. Thus, an AWQC based on a consumption rate of 17.5 g/day is protective of the general population, recreational anglers, and the Native American population within the state, and falls well within EPA's guidelines for acceptable risk levels.

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From: [Howard, Bruce](#)
To: [ECY RE Fish Consumption](#)
Subject: comments
Date: Wednesday, January 18, 2012 5:33:48 PM

I am writing to provide comments on the Department of Ecology's Publication No. 11-09-050, *Fish Consumption Rates, Technical Support Document*. I appreciate the opportunity to comment in the following areas.

- **Methodology.** While the report references important survey-based consumption information, and discusses the relative uncertainty/validity of information gathered this way, the report would benefit from observed long-term data. Given the uncertainties around the information acknowledged in the report (Chapter 4), and that the information is intended to be used "for regulatory risk management decisions" (p. 64), it is incumbent on Ecology to seek additional verification of this information, as well as peer-reviewed studies generated through traditional means.
- **Regulatory dilemma.** In Chapter 7, the report discusses several issues related to the establishment of fish consumption rates in different regulatory contexts. Ecology states a "[preliminary recommendation] of a default fish consumption rate (or rates) in the range of 157 to 267 g/day." (p. 103) The report also notes that "we are asking for input regarding identifying one or more default fish consumption rates for use in the various regulatory contexts." (p. 103) Ecology should take into account the practical effects of adopting revised FCRs.

While current FCRs may be lower than observed consumption rates, and certainly lower than the rates reported through surveys of target populations, the application of these rates in different regulatory constructs incorporates additional conservative, "precautionary principle" assumptions. Given the ubiquitous nature of some contaminants, such rates could lead to turmoil in cleanup action, even at sites that have been previously considered "clean." The potential for background-level recontamination from totally unknown sources could create a significant uncertainty around the security of proposed final cleanup actions. Within a Clean Water Act context, water quality standards could be impossible to meet, subjecting dischargers and other permittees to ongoing third-party liability. While these practical outcomes are not the focus of the analysis of FCRs, they help emphasize the need to proceed with caution, and to base any changes on the broadest and most robust scientific review possible. For this reason, the FCR updates should be delayed until the broader possible regulatory outcomes of such changes are evaluated in the appropriate policy contexts. Absent that, the option of site-specific FCRs based on target species and exposure pathways in specific areas may be appropriate for those settings wherein individuals consume high levels of fish.

- **Reasonable Maximum Exposure (RME).** The report discusses factors related to selecting an RME, settling on a recommendation "approximately between the 80th and 95th percentile". However, given the unique consumption rates by the highest-consuming individuals reported in survey summary information, this range can still skew toward an unreasonably high RME. The RME analysis deserves further discussion.

- **Discretion in applying statistical assumptions.** The report acknowledges that there is not a clear path for statistical handling of survey data (see p. 110), and notes that the analyses in this report are based on summary statistics and not data. This further underscores the need for actual data, and thorough analysis in a robust statistical fashion alongside the survey summary information.

Bruce Howard

January 18, 2012
Via email and U.S. Mail

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RE: "Fish Consumption Rates Technical Support Document," Washington Department of Ecology, September 2011,
Publication no. 11-09-050

Dear Dr. McCormack:

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) offers the following comments on the "Fish Consumption Rates Technical Support Document" (Document) by the Washington Department of Ecology (WDOE). We recognize and appreciate the substantial effort that you and others have devoted to developing the Document. The CTUIR believes that overall it is a very sound and thorough review and we compliment WDOE on its thoughtful presentation.

As you may know, the CTUIR has worked for two decades on the issue of toxics in water and fish, beginning in the early 1990s. Water and fish are among our First Foods—they are the first of our First Foods served at our ceremonies and in our longhouses. CTUIR members have Treaty Rights to fish that are free from toxic contaminants and that do not pose undue risks when consumed at levels secured by the Treaty of 1855. This includes treaty reserved interests in and beyond the greater Columbia Basin, and ranges across the Columbia River waters and its tributaries managed by Washington State.

Tribal people eat much more fish than "average" as part of our tradition, culture and way of life. Water quality and other standards in the past have utterly failed to incorporate this fact. Thank you for revisiting this issue in the Document and in the standards revision process.

The CTUIR has embraced three formally-approved fish consumption rates (FCRs): 175 grams per day (gpd) (Oregon state-wide standards; Portland Harbor), 389 gpd (on-reservation water quality standards), and 620 gpd (Treaty-based rate or Heritage rate; Hanford site). Our specific comments on the Document are provided below.

Many of the CTUIR interests in minimizing exposure to pollutants through fish consumption are impacted by both the proposed rulemaking for sediment management standards for MTCA and the surface water quality rulemaking. Where applicable the comments should be noted as concerns applicable to both processes, and protecting the treaty right to consume fish and other treaty resources without continued exposure to contaminated and dangerous fish.

P.3 (footnote). The Documents states that "Ecology has the ability to make site-specific decisions and use site-specific information, including fish consumption rates protective of tribal populations." Please clarify which discretionary and mandatory requirements obligate Washington to protect safe consumption rates for fish harvested from treaty reserved usual and accustomed fishing areas. The clarification should also address whether protections at tribal consumption rates are treated as site-specific, or to local waters rather than state-wide.

P.5 (Purpose, second bullet). In addition to the question, "where do current people fish and how much are they eating," please address the issue of whether people follow existing fish advisories. The same comment would apply on P.9, next-to-last bullet ("recent scientific data . . .").

P.6 The section on contemporary surveys should be preceded by an expanded discussion of the fact that there are depressed fish populations based on ESA listed species and suppressed consumption due to federal and state advisories that recommended limiting consumption at the time that the surveys were done. The studies listed on P.6 are worthwhile, but it should be noted that they represent suppressed rates. The Heritage rate should be explicitly recognized even if a lower rate is used for specific applications. Reliance on contemporary rates should mention fish advisories and the presence of contaminants in every major water body as reasons why people may eat less fish than they would if there was less contamination. Inserting a map of those Washington water bodies listed on the Clean Water 303 (d) list for those not meeting sediment management standards, and well those subject to MTCA or CERCLA sites not consistent with the requirements under 40 CFR §430.7 should each accompany that discussion.

The Document is unclear as to identifying how many high-consumers there are, and the adverse risk of exposure for high-consuming population if Washington chooses a less-protective FCR. For example, a large fraction of tribal children, pregnant women and elders would be disparately and adversely affected regardless of their absolute numbers.

P.7. Regarding the preliminary recommendation (157-275 gpd), please clarify what positions are discretionary from those that are required by law or other authorities. Also please clarify what percentile of the populations Washington proposes to protect, and what population of consumers will not be adequately protected (children, tribal members, non-Indian anglers, subsistence fish consumers).

As a stand-alone section, we suggest that more explicitly identifying applicable WDOE and EPA policies and regulations, those who comprise “all people” and those who are not likely to be adequately protected under various proposed rates. In the draft document, there are references to four surveys:

- “consistent with Ecology’s current policies regarding the protection . . .”;
- “... should be protective of all people in Washington who eat fish”;
- “...we think that these rates . . .”; and
- “Ecology’s current policies regarding the protection of both the general population and high exposure groups . . .”

P.9 (next-to-last bullet and elsewhere), referring to “recent scientific data[.]” Large statistical surveys are not necessarily “good science”; small tribal surveys may be more accurate because they are more inclusive of traditional lifestyles and for other reasons.

P.4 (current laws) and P.9 (second bullet). Current EPA water quality standards guidance recommends 142.4 gpd for subsistence populations when site-specific or tribe-specific data are not available. We recommend citing the guidance (EPA-822-B-00-004).

P.10 (4th bullet). Treaty Rights are mentioned without much elaboration. Throughout the Document tribes are referred to as population subgroups rather than sovereign nations. This is improper and disingenuous. While the focus of these comments here is more on technical issues and aspects, appropriate consideration of tribes, our rights and interests, and acknowledgement of the state and federal obligations and responsibilities to protect tribal treaty rights is warranted. Regarding these matters, the comments on the Document by the Center for Indian Law and Policy are useful and informative, and we incorporate them herein by reference.

P.10 (Intended Audience) and P.11 (6th bullet). Cleanup actions are a general application, but having a single FCR for MTCA purposes might help some sites (result in more protective cleanups) and hurt others. For example, the CTUIR is already using a higher FCR at Hanford, and other sites have a wide variety of rates. It will be important to involve a wider group of tribes during MTCA revisions. At present there may not be any tribal technical representation on the MTCA Science Panel (P.11, footnote).

P.11 (3rd bullet). The CTUIR Treaty-based rate (620 gpd) is as defensible, if not more so, than the CRITFC-derived rate, so the term “scientifically defensible” should be used with caution. Statistics are “scientific” only if they are applied to data sets that are properly collected and based on the right questions.

P.15 (Washington’s fish resources). Harvest data from 2006 may reflect current resources, but are a fraction of the historic rates that tribal, state and federal governments are working to restore. As Puget Sound is restored, more shellfish beds may be available for safe harvest and consumption by the public. The same can be said for the Columbia River and its tributaries in the Basin. The Document includes sections on commercial (non-Indian) and recreational fisheries but not on tribal fisheries. This creates a potential “mismatch” of using tribal fish consumption rates but only commercial and recreational harvest data. Washington needs to ensure consistency among the figures for total Washington population, total consumption and state harvest.

P.24 and Chapter 4. The lower estimate of Washington fish consumers is that only 28% of residents eat any fish at all (about 1.8 million people), which is same as the national percentage of fish consumers. The Department of Health (DOH) survey indicates that many more adults eat fish in WA (77% or about 4.8 million people) than nationally. We recommend using the DOH estimate, since it is based on an actual state-specific evaluation.

Pp.24-25, P.29. It is assumed that 10% of the Washington and national populations are high consumers, defined as eating greater than 250 gpd, because the top 10% of national fish consumers eat at this rate. This may be a reasonable assumption. However, together with the previous assumption, it might also imply that not only more do Washingtonians eat fish than the national average, but that they also eat more fish on average (i.e., that the top 10% of Washington consumers eats more fish than the top 10% of national consumers). This is likely since more fish availability likely results in larger portion sizes, or more fish meals per week.

P.27. The term “traditional fishing areas” does not convey the same weight of authority as does “Usual and Accustomed Areas,” which is a legal term of art. It may be that most, if not all, water bodies in Washington are a legally protected and adjudicated Usual and Accustomed Area of one or more tribes. For the CTUIR those rights span up and down the Columbia River and its tributaries.

P.28 (Subsistence fishers). The goal of cleaning waterways, restoring fish, and increasing harvests and consumption rates was not discussed, but should be considered in terms of potential future increases in rates. While the Document mentions future growth and future increased consumption rates, those statements could be strengthened with statements about goals for cleaner and restored waterways.

The Document says that the number of subsistence fishers in Washington is not known. Please address how many people in Washington have the right to be subsistence fishers. Many traditional tribally harvested fish populations are depressed. Current levels of tribal harvest are far under subsistence levels. For many years, tribal fish harvests are closely regulated and often impacted by ESA harvesting constraints and other factors. The adverse impact to tribal treaty rights to fish is compounded where in addition to depressed harvestable populations, those rights are suppressed where fish consumption exposes tribal people to fish unfit for safe consumption.

Rates are currently suppressed due to existing fish advisories, reduced fish numbers, and other reasons. This is a reason why current consumption rates are underestimated. In addition, recreational anglers, commercial fishermen, tribal members, and local fish market consumers can have extremely high seasonal consumption rates, so that acute exposures need to be considered.

As referred to in multiple parts throughout the Document, the two-hundred-fifty gpd falls far short of the treaty based consumption rates. Based on our research, high tribal consumption is a pound or more (454 gpd). This means that all of the subsistence fishers and most of the tribal population falls within this upper 10%. If Washington selects the 90th

percentile as the target, it has already estimated this as 250 gpd. This is roughly supported by the five contemporary studies cited, although there is quite a bit of variation and several statistical problems with those data sets. Again, the Heritage or Treaty-based rate is much higher.

The Document should identify the basis (regulatory or otherwise) for selecting what percentile of the population to protect. Washington should select a single ingestion rate within the top 10% of fish consumers which includes human health criteria that protects the usual and accustomed fishing areas of all tribes, including the CTUIR.

The Document recommends a range of 157 gpd (i.e., the 80th percentile of current statewide consumers and approximately 50% to 93% of the tribal studies) to 267 gpd (i.e., approximately 95%). This comparison suggests that the 90th percentile of national and contemporary tribal consumption is similar, and that contemporary tribal consumption is actually quite similar to national data. On the one hand, this means that Washington can avoid the argument that “special protection” is being provided to tribes, but on the other hand entire tribes (e.g., the CTUIR treaty based rate, or Suquamish) may be inadequately protected because they hold treaty reserved rights to eat much more fish than is protected under the selected rate.

Please clarify if farmed fish be factored into FCR calculations, and if so the nature of tissue concentrations to be tested.

Please confirm Washington’s consideration of ethnographic methods as valid for cross-cultural estimates (P.42, Cultural Factors)? Ethnographic methods are required for adequately capturing accurate and defensible results from tribal populations (P.43). Equating “questionnaire” with “defensible” and “ethnographic” with “non-defensible” is incorrect and invalid. Both categories provide numerical and statistical data. “Statistical” refers to precision, not necessarily to accuracy. Some interests may argue and seek to discredit ethnographic methods, traditional environmental knowledge, and Heritage rate data. Those arguments fail to consistently account for the higher fish consumption rates that Washington must protect.

Washington needs to include contextually accurate information about Heritage rates. Washington needs to include methods that are not only computer-based statistical surveys of contemporary rates. It is standard in the public health field to over-sample the population you want specific information about. The State should be explicit that it does not include information about Heritage or subsistence rates in its calculation of FCR (P.28, Tables 24, 25). This also requires Washington to specific any policy determination made concerning whether or not to expressly protect such sub-populations.

The CRITFC consumption survey did not capture data concerning subsistence fishers. We do not know the outcome of the Colville study, but we anticipate that Lake Roosevelt fish consumption rates (kokanee and other species) may not be applicable when considering salmon harvests in the lower Columbia River.

The proper citation for the article discussing problems with tribal fish surveys is: J Donatuto and B Harper (2008). Issues in Evaluating Fish Consumption Rates for Native American Tribes. Risk Analysis 26(6): 1497-1506.

Washington needs to explain its rationale for excluding any life stage of salmon and anadromous species from these efforts. Those rationales should address the issue of salmon in standards such as site-specific cleanup requirements and consider use of tribal fish consumption information to inform an approach for anadromous fish in the Columbia River basin.

P. 41 (Survey issues). Please clarify the anticipated implementation activities that would impact fish consumption rates to the Columbia River Basin and its tributaries in reference to surveyed water bodies and other attributes.

P.89 (Table 24). The 620 gpd figure (based on the *Boldt* decision) should be referred to as the traditional, Treaty, or subsistence rate, not the “historical” rate. The term “historic” implies that the rate is no longer applicable or relevant.

Thank you for your consideration of our comments. If you have any questions, please contact Barbara Harper with our Department of Science and Engineering at (541) 429-7435 or Carl Merkle with our Department of Natural Resources at (541) 429-7235.

Sincerely,

/s/

Naomi Stacy
Lead Attorney
Office of Legal Counsel

Squaxin Island Tribal Council Policy
Fish Consumption Rates
Adopted 11 January 2012

Summary

The Squaxin Island Tribe will support an increase in the Washington state, regulatory fish consumption rate to a minimum range between 157 and 267 grams per day for the current rule-making processes related to sediment management and water quality standards, if the following conditions are met:

1. Any fish consumption rate adopted not be considered a “tribal” fish consumption rate;
2. The state and tribes memorialize a process with explicit milestones to gradually increase the fish consumption rate to eventually reflect what people who consume large quantities of fish actually eat;
3. Salmon and shellfish are included in the fish consumption rate; and,
4. Other variables in the health risk assessment like cancer risk rates do not change to dilute the increased safety gained from a higher fish consumption rate.

Discussion

The Squaxin Island Tribe would like to go on record with our policy position regarding the effort by the State of Washington to revise the fish consumption rates it uses to establish sediment management and water quality standards. The objective of those standards is to protect the health of the environment and the resources it supports.

Since time immemorial, our maritime ancestors from Noo-Seh-Chatl– Henderson Inlet, Steh-Chass– Budd Inlet, Squi-Aitl– Eld Inlet, T’Peeksin– Totten Inlet, Sa-Heh-Wa-Mish– Hammersley Inlet, Squawksin– Case Inlet, and S’Hotle-Ma-Mish– Carr Inlet have lived and prospered along the shores of the southernmost inlets of the Salish Sea. Salmon and shellfish have always been and will forever be central to our cultural traditions and existence. We know ourselves as “the people of the water.”

In 1854, our representatives signed the Treaty of Medicine Creek reserving a right to harvest finfish and shellfish in all South Sound waters, and the U.S. Supreme Court has upheld that right. Implicit in reserving that right was not only that there shall always be finfish to catch and shellfish to dig, but both shall also be safe to eat.

This has led the federal government, and through its delegated authority, the State of Washington to develop statutory and treaty obligations to maintain the promised outcome of “abundant fish and shellfish safe to harvest and eat.” However, the current condition of natural resources in South Sound falls far short of our expectations and government obligations.

Focusing on the fish safety issue, the consumption rate of 6.5 grams per day (gpd) currently used to establish state water quality standards is not protective of any background, age or level of consumer of local finfish or shellfish. It is a ridiculously low amount and does not represent in any way what the majority of Washingtonians are actually eating.

The fish consumption rate must be substantially increased to protect the health of all Washingtonians. That increase must protect not just the every once-in-a-while consumer of fish or shellfish, but those who eat fish multiple times a day and more importantly, our children who are far more sensitive to any toxic contamination.

The Squaxin Island Tribe provides just one example of the many high rate fish consumers in Washington. We completed a fish consumption survey in 1996. Our upper end of fish consuming members (95th percentile) ate ~250 gpd. It should be noted that this survey was completed before the legal resolution of the Tribe's shellfish rights that assured open access to numerous shellfish species.

A 2000 survey by our neighbors, the Suquamish Tribe, probably better reflects current Squaxin consumption patterns. Their high-end consumers ate ~750 gpd.

Although most fish consumption rate surveys published to date involve tribal members, it is important to remember that groups other than tribes also consume significant quantities of fish. Other groups, like Asian and Pacific Islanders, have reported even higher levels of consumption than some of the Tribal studies. Thus, protecting the health of all Washingtonians is about more than protecting the health of tribal members.

The current rulemaking processes should reflect this broader perspective. They should not be aimed at setting "tribal" fish consumption rates. In fact, that would be highly inappropriate and a violation of tribal sovereignty. Only the Squaxin Island Tribe can set a fish consumption rate in the name of our membership.

Instead, we urge the state to view rate setting as an iterative processes to gradually increase the default, regulatory fish consumption rates to levels fully protective of the health of all Washingtonians.

The fish consumption rate is used in a mathematical equation to set maximum concentrations for toxic constituents in the environment as part of health risk assessments. In general, the higher the fish consumption rate, the lower the maximum allowed concentration of toxics. Such a balance maintains a consistent, low level of risk for human illnesses like cancer.

The September 2011 Fish Consumption Rate Technical Support Document does a good job of reviewing available fish consumption rate studies. We support its conclusion that an increase to a minimum range between 157 and 267 grams per day is warranted with several caveats.

First, everyone must recognize that an increase to even 267 gpd does not encompass how much fish some Washingtonians actually eat or wish to eat. The “wish to eat” reference alludes to some constituent groups desiring to return to more historic levels of fish consumption should availability and safety issues be resolved.

However, any substantial increase does represent a major step forward, and if considered an interim increase, will be acceptable to the Squaxin Island Tribe.

The key to acceptability will be to craft a way to acknowledge that any increase made now is an interim step toward eventual adoption of a fish consumption rate truly protective of the health of all Washingtonians, and to make transparent a formal path forward.

We are comfortable with an interim increase as proposed because at the current level of technology to analyze many toxic constituents, even at a fish consumption rate of 157 gpd, the majority will be driven to regulatory standards below detection levels. Under these circumstances, the sediment management or water quality standards will default to background conditions.

Until detection technology improves appreciably, further increases in fish consumption rates will not lessen the concentrations of toxic constituents in the environment, nor make finfish or shellfish any safer to eat. However, the technology will eventually improve and make further increases in the fish consumption rates more meaningful.

The current lack of sufficiently sophisticated analytical technology does not argue for a go-slow approach. Quite the opposite—adopting a fish consumption rate that drives standards below detection limits will force the advance of technology to occur sooner than might otherwise happen.

Therefore, we want to reiterate that a path forward to a rate truly reflective of Washingtonian’s fish consumer behavior must be boldly and forthrightly elucidated and executed for the initial step as recommended in the document to be acceptable to the Squaxin Island Tribe.

Furthermore, there is more to health risk assessment than just the fish consumption rate, although it remains key. Another factor to consider is what fish are included or not in the fish consumption rate.

Simply put, any arguments that salmon should not be included in the fish consumption rate are unacceptable. Salmon are the finfish central to our cultural traditions. It is inconceivable to us that they not be included.

Besides this cultural viewpoint, there is ample, emerging scientific evidence that salmon pick up a majority of their toxic constituents in their natal streams and Puget Sound, not from the open ocean. These local sources of toxics must be decreased to make our salmon safer to eat and that will not happen unless salmon are included in the fish consumption rate.

Finally, the previously mentioned health risk equation includes several other variables like dietary fraction, exposure duration, body weight, and inclusion/exclusion of nonconsumers. They are included in the calculation to ultimately determine the acceptable level of toxic constituents in the environment.

None of the additional variables should be changed in any way to dilute the increased health safety provided by a higher fish consumption rate. In particular, our strong preference is that there be no risk of cancer from eating our finfish and shellfish. However, when approached from a regulatory standpoint, we insist that the cancer risk rate used in the equation remain at the lowest rate allowed.

Federal Water Quality Coalition

January 18, 2012

E-Mail To:
fishconsumption@ecy.wa.gov
Washington State Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

**RE: Comments on Fish Consumption Rates Technical
Support Document, Publication No. 11-09-050**

Ladies and Gentlemen:

The Federal Water Quality Coalition (the "FWQC") is pleased to provide the following comments on Publication 11-09-050, "Fish Consumption Rates Technical Support Document: A Review of Data and Information about Fish Consumption in Washington" ("Technical Support Document"), which was issued by the Washington Department of Ecology in September 2011.

The FWQC is a group of industrial companies, municipal entities, agricultural parties, and trade associations that are directly affected, or which have members that are directly affected, by regulatory decisions made by the U.S. EPA and States under the federal Clean Water Act. The Coalition members, for purposes of these comments, are as follows: Alcoa, Inc., American Chemistry Council, American Coke and Coal Chemicals Institute, American Forest & Paper Association, American Iron and Steel Institute, American Petroleum Institute, Association of Idaho Cities, Auto Industry Water Quality Coalition, City of Superior (WI), Edison Electric Institute, Freeport-McMoRan Copper & Gold, Inc., General Electric Company, Hecla Mining Company, Indiana Coal Council, Koch Industries, Inc., Mid America CropLife Association, Monsanto Company, National Association of Home Builders, NewPage Corporation, Orange County Sanitation District, Rayonier Corporation, Rubber Manufacturers Association, Shell, Utility Water Act Group, Western Coalition of Arid States, Western States Petroleum Association, and Weyerhaeuser Company.

FWQC member entities or their members own and operate facilities located on or near waters of the United States. Some of these facilities are located in the State of Washington. Many of these facilities operate pursuant to



individual and/or general NPDES permits for discharges into those waters. Those permits often include, and will include in the future, effluent limitations based on water quality standards established by the States or EPA. The Technical Support Document will directly affect the development of water quality standards in the State of Washington, and may also serve as a precedent in the development of water quality standards in other States. The FWQC therefore has a direct interest in the matters addressed in the Technical Support Document.

The FWQC supports the comments filed as to the Technical Support Document by the National Council for Air and Stream Improvement and by the Northwest Pulp & Paper Association, and we incorporate by reference those comments and the recommendations included therein.

The FWQC appreciates the opportunity to submit these comments on the Technical Support Document. Please feel free to call or e-mail if you have any questions, or if you would like any additional information.



Fredric P. Andes
Coordinator





Community Advisory Board:

Community Coalition for
Environmental Justice

The Duwamish Tribe

Environmental Coalition
Of South Seattle

Georgetown Community
Council

IM-A-PAL Foundation

People for Puget Sound

Puget Soundkeeper
Alliance

South Park Neighborhood
Association

Washington Toxics
Coalition

Waste Action Project

*Working to ensure a
Duwamish River cleanup
that is accepted by and
benefits the community
and protects fish, wildlife
and human health.*

1620 18th Avenue #10

Seattle, WA 98122

206.954.0218

www.duwamishcleanup.org

contact@duwamishcleanup.org

January 18, 2012

Martha Hankins

Toxics Cleanup Program, NWRO

Washington State Department of Ecology

3190 160th Ave SE

Bellevue, WA 98008

Dear MS Hawkins:

The Duwamish River Cleanup Coalition/Technical Advisory Group (DRCC/TAG) was founded in 2005 by the member organizations of the Duwamish River Cleanup Coalition (DRCC), the Environmental Protection Agency's (EPA) Community Advisory Group (CAG) for the Lower Duwamish Waterway Superfund Site (the Site). DRCC/TAG provides technical support and public education, outreach and involvement services to the DRCC member organizations, the communities affected by the Superfund site, other Duwamish River stakeholders, and the general public.

DRCC/TAG has reviewed the proposed new fish consumption rates developed by the Washington State Department of Ecology and has the following comments.

Please do not hesitate to let us know if you have any questions about the attached comments.

Sincerely,

James Rasmussen

Coordinator

- DRCC/TAG agrees that the current default fish consumption rates do not reflect levels that the average population in WA State eats and certainly does not protect high fish consumers, such as Tribes, Asian/Pacific Islander and subsistence fishing families.
- Tribal and subsistence fishing communities are Environmental Justice populations that must be protected by the revised fish consumption rates.
- We endorse the decision by Department of Ecology to raise the Washington State fish consumption rates.
- We have reviewed the technical support document and think that it is, overall, a well crafted document. However, there are a few issues not fully addressed in the technical document that further support the proposed fish consumption rates, and possibly support consumption rates that are even higher than proposed:
 - As a result of Substitute Senate Bill 6197 and RCW 43.20.270, Governor Gregoire has initiated a State Policy Action Plan to eliminate health disparities in Washington State (<http://healthequity.wa.gov/>). One of the policy papers being issued in early 2012 addresses environmental exposures and hazards. Environmental exposures and hazards are not uniformly distributed across populations; low income communities and communities of color are at disproportionately high risk for environmental health disparities, including disease and death. One area of concern is the relatively new field of epigenetics – defined as changes that do not alter the DNA sequence but do cause biological changes in the body. Environmental exposures that may cause biological changes include endocrine disruptors, metals, benzene, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, diet, and social influences such as stress. Ecology’s proposed fish consumption rates will help to protect low income, minority populations by supporting actions which reduce contaminant levels in seafood, which will ultimately reduce health disparities.
 - There are other populations in Washington State that consume large amounts of seafood that are not reflected in the document. Once the following new studies are conducted, supportable consumption rates may even be higher.
 - Colville Tribe fish consumption study (results pending in 2012).
 - The University of Washington School of Public Health, DRCC/TAG and Just Health Action will be conducting a survey of Duwamish River subsistence fishermen in 2012. Evidence collected from past surveys suggests that some

Duwamish fisher people eat fish daily and give or sell their extra catch to family members and neighbors.

- Anna Schmidt's 2011 MS thesis: *An Evaluation of Fish Consumption and Environmental Concern in Low Income and Food Insecure Populations in Seattle* reports that people who obtain food from food banks in Seattle are also high fish consumers.

The evidence from these and other pending studies should be evaluated and incorporated into the Washington State fish consumption rates as they become available. In the meantime, the proposed new fish consumption rates will provide a greater level of health protections for those who currently are disproportionately exposed to contaminant levels and associated health risks from local fish and seafood. Please do not delay on the new rates. Sooner is better in this case.



January 17, 2011

Ted Sturdevant, Director
Washington State Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Re: Washington's Fish Consumption Rate

Dear Mr. Sturdevant,

I am writing on behalf of the Yakama Nation in response to your request for input on the new fish consumption rate that Ecology will use to determine water quality and cleanup standards. While we appreciate the opportunity to comment, we are concerned that the rate proposed in the Fish Consumption Rate Technical Support Document will subject Yakama tribal members to serious health risks because they consume a healthy, traditional, and Treaty protected diet. Detailed technical comments are provided in the attached document.

A century ago, when the United States Supreme Court first confirmed the Yakama Nation's Treaty Rights to take fish in all "Usual and Accustomed Places", the Court observed that for the Indians who signed the Treaty, the right to take fish from the river was "not much less necessary to the existence of the Indians than the atmosphere they breathed." That is as true today as it was then. Just as we have a basic right to breathe clean air, we have a basic human right, guaranteed by the Treaty of 1855, which the U. S. Constitution identifies as the Supreme Law of the Land, to harvest fish, which are the lifeblood of our culture, that will not make us sick when we eat them. And, just as we should not be asked to breathe unhealthy air in order to promote economic or industrial development, we do not believe that it is appropriate for Washington state to trade industry's costs for pollution prevention against the health and well-being of the Yakama People.

While much has changed in the last century, not all of it for the better, the unifying thread running through our culture is our reliance on and reverence for the native foods and medicines that have sustained our people since time immemorial. Tragically, much of that sacred resource has been destroyed in the past century and much of what remains is in a degraded condition. It is a sad irony that, while modern science has extolled the health benefits of eating salmon, pollution has rendered this staple potentially toxic. We are faced with trading decreased risk of heart disease against increased risk of cancer and other serious diseases.

We support Ecology in its effort to upgrade the indefensible fish consumption rate it currently uses. We have seen the studies showing realistic fish consumption rates nearly 100 times the

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current 6.5 grams/day. We have read Ecology's recommendation that only five to ten percent of the population should be subjected to high levels of health risk. While that improvement may seem like a good compromise to some, please consider it from our point of view. Asking us to accept health risk at the 90th percentile is the same as asking us to accept that over 1000 Yakama tribal members will be subjected to increased health risk because they choose to eat a traditional diet. Even at the 99th percentile, the lives and health of over 100 Yakama people would be treated as an acceptable risk in the name of externalizing the costs of pollution control from the industry to the resource users. Paradoxically, the healthier they eat, the greater the risk to their health. If I were to name all the Yakama tribal members who have died of cancer after spending their lives harvesting and eating salmon, this would be a much longer letter.

We point out that the 1994 Environmental Protection Agency's survey of Columbia River Tribal Members describes unusually low fish consumption numbers as a reflection of the extreme depression of fish runs at that time. Current numbers would be higher, and as we continue our comprehensive efforts to restore resident and anadromous fish including Lamprey, tribal fish consumption will rise accordingly.

Tribal Council members are not elected to decide how many Yakama people should be subjected to increased health risks to allow for industrial and agricultural development. I cannot explain to the people I represent why some of them or their children should be asked to sacrifice their health for the economic benefit of others. The Yakama Tribal Council has a solemn obligation to protect the health and welfare of each and every tribal member, including those yet unborn.

While we truly appreciate Ecology's efforts to upgrade the existing deficient standard, we cannot accept a standard that continues to subject our people to elevated risks of cancers and other diseases. Whatever number Ecology eventually lands on, we reserve all rights and remedies to protect the health and welfare of our people from the ravages of water pollution and soil contamination. If you have any questions or wish to discuss this important matter further, please contact Philip Rigdon, Department of Natural Resources Deputy Director at (509) 865-5121 extension 4655.

Sincerely,

A handwritten signature in black ink that reads "Harry Smiskin". The signature is written in a cursive, flowing style.

Harry Smiskin, Chairman
Yakama Tribal Council

cc: Craig McCormack, WADOE
Paul Lumley, CRITFC



DETAILED COMMENTS FROM THE YAKAMA NATION REGARDING WASHINGTON DEPT OF ECOLOGY'S FISH CONSUMPTION RATE TECHNICAL SUPPORT DOCUMENT

Thank you for the opportunity to review and comment on the Fish Consumption Rate Technical Support Document. It is our understanding that Ecology will consider the comments of tribal co-managers and the public to determine an appropriate fish consumption rate for the state of Washington. As reflected in the cover letter from Chairman Smiskin, the Yakama Treaty of 1855 with the United States reserved to the Yakama Nation the right to harvest 50 percent of harvestable fish, the right to have fish present to catch and, by extension, the right to have fish present in a condition that is safe to eat. After careful review and consideration, the Yakama Nation submits the following comments. These comments are supplemental to those in the cover letter accompanying this document.

A new fish consumption rate should protect all Yakama tribal members.

The fish consumption rate Washington currently uses does not reflect fish consumption rates for Yakama tribal members and therefore does not adequately protect the health of those who consume many times that amount. Ecology's proposed rate range of 157 – 267 grams of fish per day is based on percentiles (80th – 95th percentile) of a model that represents "high fish consumption" populations of the state. While certainly a more defensible proposal than the status quo, this protocol ensures that a significant portion of the tribal population most in need of protection will still be exposed to health risk. It is unclear how WDOE reconciles its choice to knowingly allow a portion of a population to be subjected to risk with its stated mission "...to protect, preserve and enhance Washington's environment, and promote the wise management of our air, land and water for the benefit of current and future generations." Ecology needs to select a fish consumption rate that is protective of all Yakama tribal members, not just a portion of them.

The 1994 EPA study is no longer accurate

Ecology references a 1994 study of fish consumption patterns among Columbia River tribes by the Environmental Protection Agency (EPA) to determine a tribal fish consumption rate. This study was conducted during a period when fish returns and tribal fisheries were among the lowest on record. Small runs and reduced tribal harvests consequently limited the amount of fish consumed by tribal members at the time of the study. There is little doubt that recent increases in fish abundance due to improved environmental conditions and extensive rebuilding efforts throughout the Pacific Northwest have allowed significant increases in fish consumption rates among tribal members. If EPA conducted a survey today, the rate would be much higher because of the increased availability of relatively abundant fish. Even without a new survey we are confident that a rate based on the 1994 study would not be protective of all Yakama members. Accordingly, the conclusions of the 1994 EPA study, if considered at all, should be viewed as minimum estimates of tribal fish consumption.

Salmon must be included.

Ecology currently includes salmon in its fish consumption rate calculation. However, the Technical Support Document dedicates an entire appendix to a discussion of excluding salmon in Washington's fish consumption rate calculations based on the supposition that salmon are transient in state jurisdictional waters and pick up most contaminants in the ocean. There are several reasons salmon must be included in the calculation of a fish consumption rate:

- a. Salmon are a crucial part of Yakama tribal members' diet, culture, and way of life. The right to these fish was reserved in the Treaty of 1855 and has been upheld in numerous court decisions. Under the U. S. Constitution, Yakama's treaty with the United States is the supreme law of the land (O'Neill 2011). If salmon are excluded, Washington will be ignoring contaminant issues that affect Yakama Nation's way of life and our rights to clean healthy fish.
- b. Salmon are encountering and acquiring contaminants in waters that are under Washington State Jurisdiction (O'Neill, 2011). While we recognize that salmon acquire contaminants in the ocean, science shows that juvenile salmon also pick up contaminants on their journey through the Columbia River basin to the Pacific Ocean (LCREP 2007). In fact some studies suggest that the more time a juvenile salmon spends in the estuary the higher its probability of injury or mortality (Loge et al. 2005). Washington can't ignore its responsibilities to ensure these fish are safe for everyone to eat.
- c. Washington State has made a commitment to salmon recovery, as expressed and confirmed by Governor Gregoire. Excluding salmon as part of the fish consumption rate is in direct opposition to that commitment. Without setting appropriate water quality and cleanup standards, the salmon will not have the toxic free environment they require for recovery.

Additional considerations are necessary.

We understand that the fish diet fraction (FDF) is "the percentage of the total fish and/or shellfish in an individual's diet that is obtained or has the potential to be obtained from the site (WAC 173-340-200)." Currently, Ecology arbitrarily chooses a default FDF of 50% in the formula incorporating fish consumption rate and exposure duration used to calculate cleanup standards at a contaminated site. In order for cleanups to be adequately protective of tribal members, Ecology must use a FDF of 100% because tribal people generally get 100% of their fish from "usual and accustomed fishing places" within state jurisdictional waters. Failure by Ecology to adjust its FDF to 100% effectively reduces by half the health protection value of any selected fish consumption rate.

Additionally, we understand that the exposure duration is the factor that determines how long a person would be theoretically subjected to the risk associated with eating contaminated fish. The state currently uses an exposure duration of 30 years, based on information that indicates 90 percent of Americans live in a particular residence for less than 30 years. This assumption is not valid for tribal populations who may move around within a region but who still rely on fish from their usual and accustomed fishing areas. For tribal fish consumers, a lifetime exposure duration is most appropriate.

We are also voicing our support of the technical comments from Catherine O'Neill titled, "Comments on Ecology's Fish Consumption Rate Technical Support Document (December, 2011)". This document supports and expands upon several of the comments included in this letter.

References

Catherine A. O'Neill. Comments on Ecology's Fish Consumption Rate Technical Support Document. Seattle University Center for Indian Law & Policy. December, 2011.

Lower Columbia River Estuary Partnership (LCREP). 2007. Lower Columbia River and Estuary Ecosystem Monitoring: Water Quality and Salmon Sampling Report.

Frank J. Loge, Mary R. Arkoosh, Timothy R. Ginn, Lyndal L. Johnson, and Tracy K. Collier. Impact of Environmental Stressors on the Dynamics of Disease Transmission. *Environmental Science & Technology* 2005. 39 (18), 7329-7336



PUBLIC WORKS

January 24, 2012

Subject: Comments on Ecology's Fish Consumption Rates Technical Support Document

Thank you for the opportunity to review and comment on the Fish Consumption Rates Technical Support Document (TSD). The City is concerned that Ecology is moving towards a very significant change in the way human health based surface water quality criteria are established. Specifically, Ecology is keeping the risk range constant at one in a million, but changing from applying it to average consumers to applying it to high end consumers in high consuming groups.

The fish consumption data presented provides a basis to compare our existing criteria with EPA's Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000). EPA's methodology says that average consumers should be protected at the 10^{-6} or 10^{-5} level and high end consumers should be protected at least to the 10^{-4} level. Our existing human health based water quality criteria meet the intent of EPA's methodology. Because people have a range of fish consumption rates, it is not possible or practical to establish one risk level applicable to all consumption rates. Consequently, regardless of the fish consumption rate basis for a criteria, those who consume less will be protected at a higher rate and those who consume more will be protected at a lesser rate. EPA recognizes this and sets certain boundaries where criteria are protective and where criteria may need to be tightened. Our current criteria appear to be protective and to not require tightening.

We recognize that Ecology could still go ahead and tighten the criteria in the interest of protecting human health, but we are concerned that the action, by focusing on fish and shellfish consumption, lacks context and balance in consideration of the various health risks associated with other sources of protein and food and also disregards the health benefits associated with fish consumption. Consequently, there is potential to do harm, by raising concerns about fish consumption and diverting people to other, potentially more harmful food. Consumers lack comparable information on quantifying risks from different types of food including red meat, poultry, dairy, processed foods, smoked foods, cereals, sweets, peanut butter, etc. Those risks may include cancer, as well as non-cancer risks, such as cardiovascular disease, diabetes, and others.

Another concern is that Ecology could set standards so low that our fish and shellfish industry would be impacted because we could end up listing all our waters as impaired for human health criteria. For example, Ecology is already listing many of NOAA's mussel watch sites in the state as impaired due primarily to PAH levels in mussels with the thresholds of concern being derived from the human health surface water quality criteria. If criteria become more stringent, then probably all mussel watch sites will need to be listed.

The following comments first address the issue of whether the fish consumption information necessitates any changes to the human health water quality criteria. Then the comments address some individual issues.

Sincerely yours,

A handwritten signature in blue ink, consisting of a series of loops and a long horizontal stroke extending to the right.

John McClellan
Operations Superintendent

The current human health criteria, based on 6.5 grams/day fish consumption rate, are protective of average consumers, median consumers of high consumer groups, and high end consumers of high consumer groups.

Our current human health surface water quality criteria were adopted for our state by EPA in 1992 in the National Toxics Rule (NTR) at 40 CFR 131.36. The criteria are based on an average general fish consumption rate of 6.5 grams a day of freshwater and estuarine (not marine) fish (salmon are counted as marine fish). At the time of the NTR, EPA gave states the option of choosing a one in a million risk level or a one in one hundred thousand risk level. Washington selected one in a million. (For comparison, Alaska selected one in one hundred thousand as the risk level, resulting in less stringent human health criteria than in Washington, by a factor of 10.) Note that these risk levels assume a 70 year lifetime of exposure.

Washington's state water quality standards do not provide specific human health criteria, but instead reference to the one in a million risk level decision made by the state back in 1992, and identifies the NTR as the place where our human health criteria are. (See WAC 173-201A-240(5) and (6)) There has been no rule-making in Washington that defined fish consumption rates for water quality criteria or adopted specific human health water quality criteria.

In the preamble to the NTR, EPA describes how the criteria are based on the 6.5 grams/day average per capita US general consumption rate specific to freshwater and estuarine fish, and also describes how if the criteria were protective at the one in a million risk level, then it would also be protective of those consuming 10 times more (65 grams/day) at the one in one hundred thousand risk level which EPA considers to be adequately protective. (57 FR 60863, December 22, 1992)

EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000) discusses cancer risk range. Note that in the following quoted section, 10^{-6} means a one in one million life time risk level, 10^{-5} means a one in a hundred thousand life time risk level, and 10^{-4} means a one in ten thousand life time risk level.

- “EPA believes that both 10^{-6} and 10^{-5} may be acceptable for the general population and that highly exposed populations should not exceed a 10^{-4} risk level. States or Tribes that have adopted standards based on criteria at the 10^{-5} risk level can continue to do so, if the highly exposed groups would at least be protected at the 10^{-4} risk level. However, EPA is not automatically assuming that 10^{-5} will protect “the highest consumers” at the 10^{-4} risk level. Nor is EPA advocating that States and Tribes automatically set criteria based on assumptions for highly exposed population groups at the 10^{-4} risk level. The Agency is simply endeavoring to add that a specific determination should be made to ensure that highly exposed groups do not exceed a 10^{-4} risk level. EPA understands that fish consumption rates vary considerably, especially among subsistence populations, and it is such great variation among these population groups that may make either 10^{-6} or 10^{-5} protective of those groups at a 10^{-4} risk level. Therefore, depending on the consumption patterns in a given State or Tribal jurisdiction, a 10^{-6} or 10^{-5} risk level could be appropriate. In cases where fish consumption among highly exposed population groups

is of a magnitude that a 10^{-4} risk level would be exceeded, a more protective risk level should be chosen.” (emphasis added)

Ecology has compiled information on Fish Consumption Rates in Washington, including studies of three Puget Sound Tribes, four Columbia River Tribes, and Asian & Pacific Islanders. The data include marine species as well as freshwater and estuarine species. The weighted median consumption rate of these groups is 69 grams/day.¹ The studies also calculated high end consumer rates and Table 1 in the executive summary identified these as:

312 grams/day – 99th percentile for Tulalip Tribe,
489 grams/day – 90th percentile for Suquamish Tribe,
247 grams/day – 95th percentile for Squaxin Island Tribe,
389 grams/day – 99th percentile for Columbia River Tribes, and
306 grams/day – 95th percentile for Asian & Pacific Islanders.

Recognize that these consumption rates include anadromous fish. Anadromous fish spend much of their life in the Pacific and maybe should not be included, or if included should be discounted some percentage proportional to the part of their lives spent outside of state waters. Consequently, the mean, median, and other percentile calculations for fish consumption rates should be lowered to account for salmon spending part of their life in the Pacific.

The question can be answered now as to whether the currently applicable human health criteria from the NTR are protective according to EPA’s methodology.

6.5 grams/day is protected at the one in a million life time risk level.

65 grams/day is protected at the one in a hundred thousand life time risk level. This is comparable to the 69 grams/day weighted median consumption, but less than the 110 grams/day weighted average consumption of the above groups. If salmon consumption is discounted by a reasonable percentage, then 65 grams/day may be comparable to the average consumption as well.

650 grams/day is protected at the one in ten thousand life time risk level. It appears that the high end consumers identified in the above groups eat less than this amount.

Clearly the median consumer from these high consumer groups is still protected at the one in a hundred thousand risk range for the consumption of freshwater and estuarine fish, and if anadromous fish consumption is reasonably discounted, the average consumer from these high consumer groups will probably also be protected in this risk range. The high end consumers

¹ Calculated from number of adults surveyed in each group and the median of each group, from Table 1 in Ecology’s Technical Support Document as follows:

$$[(73*45)+(284*132)+(117*43)+512*40)+(202*78)] \div (73+284+117+512+202) = 69$$

from Table 1 are protected at better than the one in ten thousand risk range which meets EPA's methodology.

While the above groups will consume fish and shellfish mostly from state waters, and anadromous fish that spend part of their life in state waters, much of the rest of the general population will be consuming store bought fish, mostly not from state waters. Approximately 84 percent of the seafood consumed in the United States is imported, about half of that is sourced from aquaculture and domestic aquaculture provides only about 5 percent of seafood consumed in the United States.² The general population's fish consumption rate needs to be discounted to reflect fish not from state waters.

When making some adjustment to the fish consumption rate for anadromous fish consumption by the surveyed populations and for fish not from state waters for the rest of the general population, it appears that there is no need to revise the human health water quality criteria in Washington State. We also note that the current human health criteria are adopted by EPA for the state, and EPA is neither requiring the state to adopt new criteria, nor are they proposing rulemaking to change the currently applicable criteria. The human health criteria are protective within EPA's guidelines.

The City of Everett is concerned that in spite of a lack of regulatory need to change the human health criteria, Ecology is proposing to establish a default fish consumption rate in the range of 157 to 267 grams/day (based on upper 80th and 95th percentile consumption rates for high consumer groups), while applying the 10^{-6} risk level to these rates. This is a very substantial shift from setting 10^{-6} criteria to protect the average consumer which is the basis for our current human health criteria. It will be setting 10^{-6} criteria to protect the upper 80th to 95th percentile consumers of high consuming groups and counting salmon consumption fully. It will result in more stringent criteria (lower by factors of 24 to 41). It will result in having to list more waters in our state as impaired for failing to meet criteria. Such listings could impact the marketability of Washington fish and shellfish products and undermine recent efforts announced by the state and by NOAA to increase the amount of shellfish aquaculture.³ It may also scare people away from consuming fish and towards consuming other food which may be more risky, but for which Ecology provides no useful comparisons with which to make informed choices.

Significantly, some of the parameters that will be most problematic are actually legacy contaminants, no longer in production, that reside in and cycle through the biota. These include PCBs, DDTs and dioxins and furans. There are limits as to just what can be done to bring the tissue levels of these contaminants down and tissue levels do not really represent exceedences of water quality criteria. Tissue levels for some contaminants such as PCBs in salmon already

² NOAA. June 2011. National Oceanic and Atmospheric Administration Marine Aquaculture Policy. http://aquaculture.noaa.gov/pdf/noaa_aquaculture_policy_2011.pdf

³ See press release from the Office of the Governor, December 9, 2011 at http://www.ecy.wa.gov/news/2011/gov_20111209.html

exceed a 10^{-6} risk level based on 6.5 grams/day consumption⁴. Yet monitoring of surface and deep water from multiple stations in Puget Sound consistently show total PCBs at levels well below the human health based water quality criteria.⁵ Increasing the fish consumption rate, thereby making the criteria more stringent isn't going to speed the recovery or improve human health. But it will result in existing tissue concentrations being seen as exceeding human health criteria by much greater margins,⁶ and it might cause people to steer away from fish consumption towards something less healthy.

The City suggests that if any change to the fish consumption rate is considered, it should be just to match the basis for EPA's national recommended water quality criteria⁷, which are based on 17.5 grams/day for protection at the 10^{-6} risk level, and which provides 10^{-5} risk level protection for 175 grams/day, and 10^{-4} risk level protection for 1,750 grams/day. This clearly provides better than 10^{-5} risk level protection for both the weighted median and the weighted average consumers from the studied groups and provides better than 10^{-4} risk level protection for the high end consumers. Even Ecology's calculated 157 grams/day for the 80th percentile value of the studied groups is protected at better than 10^{-5} .

⁴ For example, 5.3 ppb wet weight total PCBs in fish tissue is considered to be the 10^{-6} threshold that our current human health criteria are based on. (From spreadsheet provided to Lincoln Loehr by Brandee Era-Miller on June 22, 2011.) Chinook salmon everywhere exceed this (see figure on page E-11 in the TSD).

⁵ See Table E-20 in Ecology 2011. *Control of Toxic Chemicals in Puget Sound Characterization of Toxic Chemicals in Puget Sound and Major Tributaries, 2009-2010*. Publication No. 11-03-008.

⁶ The PCB threshold will drop from 5.3 ppb wet weight to as low as 0.13 ppb wet weight, meaning that all Chinook salmon will exceed the criteria by a factor of 100 or more.

⁷ EPA 2002. *National Recommended Water Quality Criteria: 2002*. EPA-822-R-02-047.

Specific comments.

Concerns with the Suquamish fish consumption data.

Tables 1 and A-1 and C-1 identify 284 adults surveyed for the Suquamish Tribe. The text on pages 55 and 56 indicates that there were only 92 respondents out of a total of 142 potentially eligible tribal adults in the Suquamish study. It is not at all clear how 92 respondents equals 284 adults surveyed.

The Suquamish data also indicate some very high consumption rates compared to other Tribes. Have the data been made available for review? We understand that the data are not available to others who have requested, and that raises concerns about putting too much weight on the study.

Reanalysis by EPA Region 10 of Asian Pacific Islander consumption rates.

Table 1 shows a median fish consumption rate of 78 g/day and a 95th percentile of 306 g/day for Asian & Pacific Islanders, and this is used by Ecology without adjustment in developing recommended fish consumption rates.

Pages 60-62 show that EPA Region 10 reanalyzed the API data to correct for cooking weight loss, regional harvest and API population demographics and determined median fish, shellfish and crab consumption to be 5.9 g/day, and the 95th percentile to be 57 g/day (and these included salmon consumption). When salmon consumption was excluded the values dropped to 5.3 g/day and 51.1 g/day.

The reanalysis was done to develop API fish consumption rates to establish cleanup levels in the Lower Duwamish Waterway. The reanalysis provides some important insights. The significant difference from the overall API study illustrates why Ecology should not adopt a default fish consumption rate for use across the sediment, water quality and MTCA programs.

Regulatory decisions. Should they ultimately lead toward eliminating – or minimizing – risk to human health?

Ecology asserts at the bottom of page 102 that regulatory decisions should ultimately lead toward eliminating – or minimizing – risk to human health. This sounds initially like a reasonable goal, but when selectively administered in the confines of health risks from eating fish and shellfish, while ignoring other very substantial dietary risks, could have the opposite effect. An understanding of comparative risks would be good.

Human health criteria based on 10^{-6} risk applied to high end consumers could result in conclusions by Ecology in the 303(d) listing of impaired waters program, and other programs as well, that criteria are exceeded. Publicity could divert people away from consuming fish or shellfish. They would consume something else for which we have no

similar evaluations of risk level, and for which the risks (including cardiovascular) could be much greater. As such, it could result in increasing risk to human health. Regulatory decisions such as are considered here should be made and put in context of relevant relative risks.