STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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September 24, 2013

Ms. Elizabeth Mooney, President and Members
PERK – People for Environmentally Responsible Kenmore
5934 NE 201st St
Kenmore, WA 98028

Subject: Ecology Response to PERK Letter 7/10/13 to Ecology for *Dioxin in Kenmore Area Sediment & Water Characterization Environmental Report*

Dear Ms. Elizabeth Mooney and PERK Members,

Thank you for your letter dated July 10, 2013 and comments on the Department of Ecology (Ecology) Environmental Evaluation Report for the Kenmore Area Sediment & Water Characterization Results dated May 23, 2013 and publication number # 13-09-174 (SSAP Report). Ecology appreciates your suggestions and recommendations. This letter gives Ecology responses to the points stated in the PERK letter, see attached.

The consulting company Anchor QEA published their report entitled, "Sampling and Analysis Results Memorandum for Kenmore [Area] Sediment and Water Characterization" and dated March 2013. Note Anchor QEA published their report in March 2013 and Ecology published our report on May 23, 2013.

Many of the points that PERK lists are consistent with Ecology's report and priorities for the Kenmore area. Ecology stated that the November 2012 sediment study was a screening study and further work will be conducted for dredge planning and environmental evaluation. Ecology states that more work will be conducted at the two private marinas, and to identify the source or sources of dioxin.

Here are *Ecology's responses in italics* to each of the points stated in the PERK letter.

1. PERK page 2, paragraph 4 states that "DOH [Washington Department of Health] was not critical with Ecology's findings."

   *Note that WDOH, DMMP [Dredge Material Management Program including the US Army Corps of Engineers, US EPA, Washington Department of Natural Resources and Ecology] and the City of Kenmore reviewed the SSAP Sampling Plan and the draft SSAP Report. WDOH commented on the Ecology drafts, and Ecology and the City took those and other comments including KAN [Kenmore Action Network] comments into consideration and revised the SSAP Sampling Plan and SSAP Report.*

*Department of Health was not able to respond. To read the DOH Health Consultation for the Kenmore Area see www.doh.wa.gov/consults or telephone Washington State Department of Health, 1-877-485-7316.*

2. PERK page 2, paragraph 5 states that "Ecology's health and safety assurances are premature."

   *Ecology states that this was a screening level evaluation. Screening levels are more stringent than cleanup standards. This makes screening studies very precautionary.*

3. PERK page 2, last paragraph – page 3 lists sampling parameters: sample frequency, weather, [number of] sample sites, sample depths, and barging frequencies. PERK states that this list showed that the [Ecology] screening study did not address many potential environmental conditions…deeper samples, inclement weather, barge-caused impacts, and statistical powers from more sample sites.

   *Ecology states that any study can give a snapshot in time of current conditions. The Ecology study used a variety of locations to represent the different types of areas –public access, proposed channel dredging area, marinas where earlier high levels were detected, and the sediment surrounding the KIP site [Kenmore Industrial Park site aka Lakepointe site]. As a screening level evaluation, sufficient sample sites were selected to identify areas of concern and address potential health risks at the local public access points. Additionally, the sampling was guided by comments from KAN [Kenmore Action Network] and others during the Kenmore Area Sediment Sampling Plan public comment period [October 15-29, 2012].*

   *The study gives information on the general ongoing condition of the sediments and cannot evaluate every episode, especially given the limited funding available for the screening evaluation as well as the public desire to quickly obtain information on the potential public health risks. Note that the channel sediment concentrations were similar to the other locations in and around Puget Sound, except the two private marinas. Future studies of the marinas and the channel sediments will address the other issues (e.g., sediment condition at depth and exposure due to barge disturbance). Ecology, if funding is available, will pursue the source or sources of contamination at the marinas.*

   *Note, dioxin and PCBs adhere tightly onto fine sediment particles. The calm sediment sampling conditions were appropriate to study dioxin and the distribution of these pollutants in the area sediment to potentially assess current source conditions. For water sampling, while conditions did not represent a worst case scenario (high suspended fines), the sampling conditions for water quality represented typical conditions for wading, swimming, and boating.*

   *Given the funding limitations, it was important to sample near the surface where people could likely come into contact with potentially contaminated sediment. In the channel and marinas, the next study will involve deeper sediment depths. Further sampling of the channel and marinas for dredging will extend to and beyond the dredging depth.*

4. PERK Page 3 paragraph 3 states that "PERK's dioxin narrative below suggests…some high dioxin levels probably have not been found… and Ecology conclusions were misleading."

   *As previously stated, this study was a screening level evaluation as a first step to assess the sediment conditions in these areas. Follow-on studies will involve deeper sediment sampling in the channel and marinas. Further sampling of the channel and marinas for dredging will extend to and beyond the dredging depth.*

5. PERK Page 4 top paragraph states that "…we need to practice the Precautionary Principle, avoid risky conclusions, address budget realities, and pursue environmental protection and economic outcomes at the same time."

   *Ecology followed recommendations provided by KAN and others in public comments in developing the Kenmore area sediment study, and selected sample sites that represent the most likely areas for public exposure to the sediments and their contents. This was a high concern for Ecology in planning the study.*

6. PERK Page 4 paragraph 2 under "Dioxin in Kenmore, "the Report's conclusion that sediment environment in north Lake Washington is healthy and typical of undisturbed areas is grossly misleading."

   *I respectfully disagree. The Ecology report (Ecology Publication No 13-09-174, May 2013) states that "...The [near shore northeast Lake Washington] sediment results represent a relatively healthy near shore environment and natural background levels, except at the two private marinas" (page 12 section 6-A). In the conclusions, the report states that "The Kenmore area sediment and water characterization results show that both sediment and water at northeast Lake Washington and the lower reaches of the Sammamish River are below the state cleanup requirements with the exceptions of the two private marinas"(page 18 section 9).*

   *The sediment results for dioxin in the public access and channel areas are below what is typical of residential area soils in Seattle and below the calculated cleanup standard for soils for risks associated with dermal contact and incidental ingestion exposure. The purpose of the report's conclusion was to provide some assurance to the risk from dermal contact and incidental ingestion associated with wading, swimming and beach play in the public access areas. This sediment screening evaluation does not address risks associated with consumption of fish.*

   *Ecology notes that due to the high fish consumption rates that need to be included in any sediment human health risk assessment, "safe" dioxin levels at a risk level of $10^{-6}$ in sediment are likely much lower than for soil.*

7. PERK Page 4 paragraph 4 states, "In Log Boom Park…the highest assessed risk is… the carcinogenic Polynuclear Aromatic Hydrocarbons (cPAHs) with estimated relative risks greater than Ecology's $10^{-6}$ (10 to the minus 6) standard."

*Ecology understands that cPAHs also represent potential risk to humans. The WDOH report indicates that with the exposure scenarios they evaluated, cPAH risks were below levels of concern. Note, this is a screening level study, and for human health risk see the DOH Health Consultation for the Kenmore Area see www.doh.wa.gov/consults or telephone Washington State Department of Health, 1-877-485-7316.*

*The Ecology results show that all chemicals tested at Log Boom Park are below the Model Toxics Control Act (MTCA) Sediment Management Standards (SMS) Freshwater Sediment Screening Criteria called Sediment Cleanup Objectives (SCO) that show NO adverse effects to benthic community. Note that these values are different from the $10^{-6}$ human health risk based concentrations. The state cleanup process, following MTCA takes into consideration protection of human health and the environment and this is described as a risk at or below 10 to the minus 6 standard. For more detail, see point 18 Ecology response below.*

8. PERK Page 5 paragraph 4 last line states, "...it is important to collect additional data…conduct statistical analyses…develop and implement management plans that would reduce dioxin exposure and risk.

*Ecology agrees that the higher dioxin levels found in the marinas merit follow up, and Ecology will do so contingent upon funding and resources. Additional samples will be collected of the deeper sediments associated with the dredging characterization studies for the channel and marina areas. The PERK letter offers some possible approaches to addressing the results at the marinas. Ecology is not able to comment on these suggestions until additional research is conducted. If an ongoing source is identified, MTCA and SMS already require source control as an integral part of sediment cleanup.*

9. PERK Page 5 paragraph 6 states that "Comparing sediment dioxin concentrations to soil concentrations and standards is inappropriate…and can be an order of magnitude higher than those required for sediments."

*Ecology states that in general the Kenmore area sediment results all meet the new MTCA and SMS sediment screening criteria except at the two private marinas and one occurrence of two phthalates at the Navigation Channel. A numeric screening criteria for dioxin has not been promulgated, so no comparison for dioxin sediment screening criteria is available at this time.*

*Since Ecology is primarily concerned about skin contact, the soil findings in Seattle area do make an appropriate comparison for context. Indeed, skin contact with sediments differs from skin contact with soils, as pointed out at the July 11, 2013 meeting. In the water, sediments do not remain in contact with the skin, as is more the case on land.*

*The purpose of this comparison was to provide some assurance to the risk from dermal contact and incidental ingestion associated with wading, swimming and beach play in the public access*

*areas. This sediment screening evaluation does not address risks associated with consumption of fish.*

10. PERK Page 6 paragraph 1 states that "Sediments delivered by the Sammamish River … may affect … dioxin levels in other north Lake Washington near shore areas."

    *Based on the surface sediment samples collected, the sources of the dioxins appears to be associated with the marinas or possibly near shore areas near the marinas and not the Sammamish River, KIP or channel areas. Additional surface and subsurface sampling will be needed to evaluate the nature and extent of the dioxin contamination.*

11. PERK Page 6 paragraph 2 "PERK states that Ecology states that "…excluding the two private marinas results, the Kenmore dioxin sediment results show very similar dioxin concentrations as found in Puget Sound background (DMMP 2009)." PERK states, "We believe that this conclusion is unfounded."

    *Ecology was discussing SSAP Report Table 9 from the DMMP Ocean Survey Vessel Bold background marine sediment data where the Puget Sound OSV Bold samples showed a range of 0.24 to 11.6 pptr (parts per trillion) and average at 1.42 pptr (DMMP 2009) while the Kenmore freshwater sediments without the two private marina results showed a range of 0.30 to 10 pptr and average at 3.03 pptr. Statistical analysis were not performed on these results at this time because of this study being a sediment screening evaluation.*

12. PERK Page 8 first line states "The DMMP [Dredged Material Management Program including the US Army Corps of Engineers, US EPA, Washington Department of Natural Resources, and Ecology] "screening level" standard is meant to protect human and ecological health."

    *PERK states that the DMMP value is "meant to protect human health and ecological health." While it was the goal of DMMP to protect human and ecological health, DMMP ended up using a background-base value, since human health assessment would put protective levels at below analytical detection. This is consistent with the Sediment Management Standards, as discussed in point 18 of this response letter.*

13. PERK Page 8 Conclusions and Recommendations paragraph 2 states "KNC sediments are not at "natural background levels."

    *Ecology states that Kenmore Navigation Channel sediments are consistent with levels in the Seattle area. Ecology believes that while the marinas need further evaluation and source tracing, the levels in the rest of the study area are comparable to the levels found in other sediments and soils in the Seattle area.*

    *Ecology uses the term natural background to describe the natural and anthropogenic (globally distributed concentrations) level of substances in the environment that are not from a point*

*source or a specific source of contamination. Natural background means the concentration of a hazardous substance consistently present in the environment that has not been influenced by localized human activities. The natural and anthropogenic (globally distributed concentrations) level of substances in the environment are not from local sources or activities (WAC 173-204-505(11).*

14. PERK Page 8 Conclusions point 1. "Instead of comparing the screening level results to soil concentrations of dioxin, the [Ecology] report should reinterpret and describe the dioxin results in light of the DMMP standards and dioxin levels reported for other areas."

    *The Ecology Report does so. DMMP will require additional profiling of the sediments in the proposed channel dredging area beyond dredge depth for purposes of in-water disposal.*

15. PERK Page 8 Conclusions point 2. "Immediate steps should be taken to restrict public use based on the Precautionary Principle… and to evaluate… risk they pose to human and environmental health."

    *Washington Department of Health was not able to respond. To read the WDOH Health Consultation for the Kenmore Area see www.doh.wa.gov/consults or telephone Washington State Department of Health, 1-877-485-7316.*

    *Ecology believes that the Kenmore area sediment results profile is consistent with other studies in the Seattle area. Ecology believes that outside the marinas, the study area reflects urban background conditions and the people are not exposed to sediment conditions that could likely cause health problems.*

    *This study does not address risks associated with eating fish. However, the WDOH currently has a fish advisory for PCBs which provides notice to the public for the hazards of resident fish consumption.*

16. PERK Page 8 Conclusions point 3. States that Ecology should develop a specific plan to determine the source or to clean up the areas where excessive contamination was found.

    *Ecology does support further evaluation and source tracing of contamination found at the marina sites.*

17. PERK Page 9 Conclusions point 4. States that the source of dioxins should be identified and Ecology should statistically analyze…and compare results with other areas such as Puget Sound.

    *Ecology supports source or sources identification for the elevated readings found at the two private marinas. Statistical analysis will be performed in future studies as appropriate.*

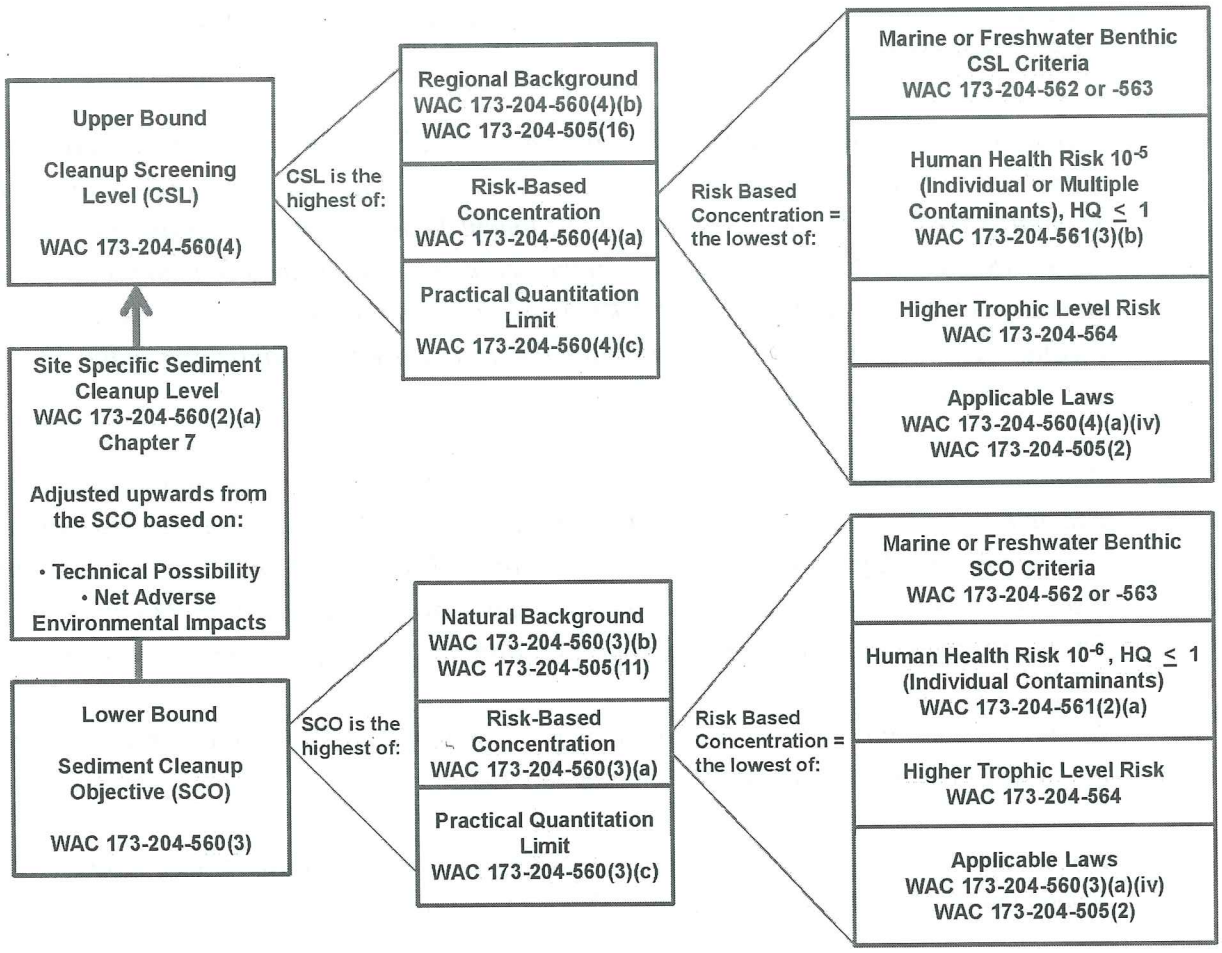
18. PERK Page 9 Conclusions point 6. "Ecology should accelerate efforts to develop Sediment Management Standards for dioxin.

*Human health risk evaluation of sediments involves a lot of site specific information (exposure scenarios, consumption rates, etc). Because of this, Ecology chose not to develop numeric standards for dioxin in the newly revised Sediment Management Standards rule. However, the Part V (Sediment Cleanup Standards) in the Sediment Management Standards incorporates risk (human, ecological, and benthic), background, and quantitation limits to establish sediment cleanup levels. Below is a figure outlining the framework for establishing sediment cleanup levels, and cites the applicable rule section.*

*Assessing human health risks for chemicals like dioxin include the use of relatively high consumption rates in the Pacific Northwest. This will often result in target tissue values (safe levels in fish for high consumption rates) that are below current analytical detection limits. Therefore, the sediment cleanup objective, and potentially the sediment cleanup level, will likely be established at natural background or quantitation limits, depending on the compound(s).*

*Ecology is currently working on guidance for development of natural and regional background and a draft is estimated to be available by fall 2013.*

*Figure shows the human health risk evaluation framework for establishing sediment cleanup levels and cites the Washington applicable rule section.*




I appreciate working together with you and PERK for a healthier environment in the Kenmore area. If you have questions or request additional information, please contact me at the Northwest Regional Office by email at mobr461@ecy.wa.gov or by telephone at 425-649-7249.

Sincerely,

Maura S. O'Brien, PG/HG #869
Professional Geologist/Hydrogeologist and Site Manager
Toxics Cleanup Program

Attachment

# ATTACHMENT

## PERK Letter

## July 10, 2013

July 10, 2013

Maura O'Brien
Washington Department of Ecology
Toxics Cleanup Program
3190 160th Avenue SE
Bellevue, WA 98008

Re: *Dioxin in Kenmore Area Sediment & Water Characterization Environmental Evaluation Report*

Dear Ms. O'Brien,

Thank you for the opportunity to submit our comments on the report entitled *Kenmore Area Sediment & Water Characterization Environmental Evaluation Report*[1] (Report) that your agency published in March 2013.

As you are aware, People for Environmentally Responsible Kenmore (PERK) has been actively engaged with Ecology and the City of Kenmore in efforts to ensure that desirable environmental conditions in Kenmore, including adjacent portions of the Sammamish River and north Lake Washington, are maintained for the benefit of current and future residents.

Below, we offer our assessment, conclusions, recommendations, and an Appendix of supportive studies and data - all related to contamination by the dangerous chemical dioxin[2] of lake sediments in north Lake Washington. To the extent that they differ from the conclusions and recommendations stated in the Report, we would be grateful if you would address them.

**Ecology's Report**

The Report's *public access areas include Log Boom Park and the motor boat launch areas and limited public access areas included Kenmore Harbor, Kenmore Navigation Channel, Sammamish Navigation Channel, Harbour Village Marina, and Kenmore Industrial Park (KIP).* The Report states that sediment sampling and chemical analyses were conducted at a "screening level" to (1) *inform planning for dredging of the Kenmore Navigation Channel, and (2) determine whether conditions pose a risk to human health and the environment. The report describes the sampling methods, presents the results of the chemical analyses, and concludes, "Aside from the two private marinas, these results represent a relatively healthy near shore environment and natural background levels."*

**Department of Health Consultation (HC)**

On June 27, 2013, the Washington Department of Health (DOH) issued a "Health Consultation" (HC)[3] that basically supported Ecology's findings. DOH stated *"the levels of contaminants found in sediments*

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[1] https://fortress.wa.gov/ecy/gsp/DocViewer.ashx?did=20239
[2] http://www.ejnet.org/dioxin/
[3] http://www.doh.wa.gov/Portals/1/Documents/Pubs/334-333.pdf

*are below levels of health concern. Exposure to sediments in these areas is not expected to cause non-cancer health effects. The estimated cancer risk associated with exposure to the sediments is considered low to insignificant and is based on lifetime exposures (72 to 78 years). Cancer risks are estimated and should not be taken to represent actual or likely risks for the public. The risks could be as low as zero."*

*DOH reached two important conclusions about sediment, groundwater, and surface water:*

> ***Conclusion 1:*** *Touching, breathing, or accidentally eating sediment from public access areas, as well as areas with limited public access, is not expected to harm people's health.*
>
> ***Conclusion 2:*** *Swimming or accidentally ingesting groundwater discharging from the KIP site or surface water tested by the City of Kenmore near Log Boom Park is not expected to harm people's health.*

**PERK's Perspective on DOH HC and Ecology Report**

PERK respects DOH and Ecology for doing yeoman's labor on these studies under budget constraints, but with all due respect, the sampling parameters, exposure factors, and the Precautionary Principle support very different conclusions from those set forth in your studies. The next section on "Dioxin at Kenmore" provides supportive explanation for the following.

**First, DOH was not critical with Ecology's findings.** DOH, by assuming that Ecology's conclusions on the "levels of contaminants" and their locations accurately reflected Kenmore's environment, accepted Ecology's Report data at face value without questioning the data's uncertainties of which there are many.

**Second, Ecology's health and safety assurances are premature.** A "screening level" study for Kenmore, a shoreline community with legacy pollution and continuing commercial activities, requires follow-up studies before health and safety extrapolations. At a minimum, conclusions should adopt a precautionary approach and caveats.

**Sampling parameters**

PERK submits that given budget constraints, Ecology did not and could not adequately address many important data collection parameters in a screening study. Some key parameters are listed below, with actual sampling done in parenthesis.

- Sample frequency (one-time major "screening-level" survey without commitment[4] to follow-up studies).
- Weather (good collection weather only, thus excluding impacts from inclement weather with higher stormwater runoff).
- Sample sites (limited).

[4] A commitment should give "SMART" results - meaning Specific, Measurable, Achievable, Realistic and Time scaled, plus funding.

- Sample depths (primarily shallow so information from deeper sediment layers are not included), and
- Barging frequencies (zero for several days before sampling so sediment disturbance was minimized).

This list showed that the screening study did not address many potential environmental conditions, such as legacy contamination in deeper sediment layers, sediment and water quality altered by inclement weather, water column or bottom substrate changed by barging-caused sedimentation, or area coverage and statistical powers increased by more sample sites.

Relating sediment depth to exposure, Kenmore samples use the "biologically active layer" as basis to select sample depths. For the Kenmore Channel and other highly managed Lake Washington near shore areas, barge traffic, development projects, and other human impacts have occurred over time. Consequently, sediment is likely disturbed to greater depths than what was monitored in the recent sampling. Deeper samples, therefore, are likely more informative than shallower samples.

If follow-up studies were conducted, dioxin exposure results could be much higher, perhaps by magnitudes, and at locations not currently specified. To be fair, results could also remain unchanged or even have lower exposures. PERK's dioxin narrative below suggests, however, that at the minimum, some high dioxin levels probably have not been found. At a more significant level, Ecology conclusions were misleading.

**Exposure factors**

DOH specified that key factors - including

- Dose (how much),
- Duration (how long), and
- How someone comes in contact with the chemicals (touching, ingesting, or breathing in the chemical),

determine if an exposure will cause health effects. After vetting uncertainties of sampling parameters and exposure factors, particularly Dose, the DOH Consultation can only have inconclusive inferences at this time. Again, the dioxin discussion below illustrates this point.

**The Precautionary Principle**

PERK agrees that with budget constraints, a "screening level" study is realistic. But there is only so much inference a "screening-level" study can provide. By declaring public health and safety conclusions without major caveats, Ecology, Kenmore, and now DOH - despite their fine work, funding commitments, and sincerity - are being unreasonably optimistic on citizen health and safety. Clearly if key exposure factors vary, such as Dose, so will the health effects evaluation. The bottom line is that we need to practice the Precautionary Principle, avoid risky conclusions, address budget realities, and pursue environmental protection and economic outcomes at the same time.

**Dioxin at Kenmore**

As the evidence provided below demonstrates, the Report's conclusion that sediment environment in north Lake Washington is healthy and typical of undisturbed areas is grossly misleading. Ecology should either retract or reword the conclusion to indicate that there is substantive evidence to support an alternative conclusion; namely, that dioxin levels in north Lake Washington are unsafe. Moreover, Ecology should modify its recommendations to include special restrictions on sediment management and human activities in north Lake Washington where exposure to dioxin is likely until needed additional sampling and evaluation have been conducted.

Our assessment focuses on one chemical constituent – dioxin/furans (dioxin[5]). In terms of its effects on humans and other living organisms, dioxin is so toxic that one group of scientists describe it as "next to the nuclear catastrophes" in its potential for causing adverse impacts. Dioxins are produced by natural processes, such as volcanic eruptions or forest fires, but most dioxins derive from human activities, including manufacturing of paper pulp and herbicides or pesticides, burning of plastics and toxic waste at high temperatures with waste incinerators or kilns, as well as motor vehicle exhaust.

Dioxin is not the only health risks in sampled chemicals. In the Log Boom Park, the highest assessed risk is not dioxin/furans but the carcinogenic Polynuclear Aromatic Hydrocarbons (cPAH's), with estimated relative risks greater than Ecology's 10-6 (10 to the minus 6) standard.

**Dioxin at two private marinas isolated instances?**

North Lake Washington has higher concentrations of dioxin than are typical of freshwater and marine environments in rural and urban areas in Puget Sound. Sediment samples collected in the vicinity of two marinas on the western shore of north Lake Washington had dioxin levels that far exceed levels considered safe for human health and ecological function. They confirm a much higher dioxin reading (92.1 ppt) recorded for a composited sediment sample at the Harbour Village Marina in 2011.

These concentrations would normally trigger regulatory action (i.e., cleanup) by Ecology under the Model Toxics Control Act (Chapter 173-340 WAC). They far exceed the median cleanup level at dioxin/furan-contaminated sites in Washington State (16-24 ppt) and the "cleanup level for dioxin" (11 ppt) proposed by Ecology (2007).[6] Given the number of people living in the Kenmore area and the existing status of the north Lake Washington ecosystem, the measured dioxin concentrations are high enough to warrant concern. Specifically, even if contamination is restricted to private marinas, there is potential for people to be exposed to elevated levels of dioxin, and for benthic organisms and the fish and birds that prey upon them to be adversely affected. And at this time the boundaries, or lateral limits of dioxin at elevated concentrations have not been defined, or determined to lie solely within the two marinas cited by Ecology.

Ecology implies that dioxin at the two marina sites could not have come from the Navigation Channel, the KIP site, or the Sammamish River because concentrations at the latter locations were significantly lower than those measured at the two marinas. Other than speculating that the high dioxin

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[5] See Footnote #2: http://www.ejnet.org/dioxin/

[6] Ecology Toxics Cleanup Program. 2007. Background document for the proposed amendments to the Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC.

concentrations may have resulted from a "historic release" and that dioxin contamination is now neither ongoing nor continuous, Ecology does not investigate or confirm the actual sources or causes of the elevated dioxin levels. It is certainly possible that the dioxin may have originated in an adjacent area, such as the KIP or Kenmore Air, but subsequent sedimentation and disturbance at these locations may have obscured the relationship.

Since a very high dioxin concentration was measured at Harbour Village Marina in 2011, why wasn't additional sampling (more samples taken over a greater range of depths) for dioxin performed in this and adjacent areas? Ecology should have used statistical analysis and modeling software to help visualize the spatial distribution of dioxin within north Lake Washington, predicted values at un-sampled locations, and identified potential sources of contamination. A mass balance evaluation would also be useful in calculating the total mass of Mean Toxic Equivalence (TEQ) in sampled sediments within different areas of north Lake Washington.

Again, given results obtained thus far, it is important to collect additional data, conduct the appropriate statistical analyses and modeling, and develop and implement management plans that would reduce dioxin exposure and risk.

**Judging dioxin concentration**

Ecology compares the dioxin concentration measured in the sediments of North Lake Washington to concentrations of dioxin measured in soil samples collected from urban areas in Seattle. They also compare the results to the state soil cleanup standard for dioxin of 11 ppt.

Ecology's comparisons were not based on statistical analysis, and therefore should be regarded as qualitative. Comparing sediment dioxin concentrations to soil concentrations and standards is inappropriate, since standards for cleanup of contaminated soils can be an order of magnitude higher than those required for sediments.

Furthermore, the physical processes affecting dioxin distribution and exposure in the two media are very different. Sediment transport, deposition, and re-suspension processes in Lake Washington contribute to temporal and spatial variations in residual dioxin concentrations that differ from those of surrounding upland areas. Sediment delivered by the Sammamish River and subsequently stirred up by barge activity in the Kenmore Navigation Channel, for example, may affect, either through dilution or concentration, dioxin levels in other north Lake Washington near shore areas.

Ecology also compares the dioxin TEQ concentration for north Lake Washington with the mean concentration results reported for Puget Sound sediment by DMMP (2009), and concluded that "excluding the two private marina results, the Kenmore dioxin sediment results show very similar dioxin concentrations as found in Puget Sound background." We believe that this conclusion is unfounded. The two means for the north Lake Washington samples - 12.5 when the two marina values were included (n = 30), and 3.0 (n = 28) when the marina data were excluded - are both significantly different (higher) than the mean (1.4 ppt) calculated for the Puget Sound samples.

The mean dioxin TEQ concentration (12.5 ppt) for the 30 north Lake Washington samples was also significantly higher than mean dioxin values reported for Elliott Bay sediment samples[7], soil samples collected in vicinity of the Rayonier Mill, and at other locations in Washington State (See Table 1). Additionally, north Lake Washington dioxin levels were higher than concentrations measured in soil samples collected from 2 of 6 urban areas in Seattle (WDOE 2011).[8] The same study reported a mean dioxin concentration of 1.7 ppt for soils sampled from Washington state parks.

**Table 1:**

*Rayonier Mill Off-Property Soil Dioxin Study*
*Final Project Report*

**Table 8-1 Comparison soils datasets: summary statistics**

| Location | Reference | Number of Samples | Range (ng/kg TEQ) | Median (ng/kg TEQ) | 75th Percentile (ng/kg TEQ) |
|---|---|---|---|---|---|
| Port Angeles, WA | this study | | | | |
| grid | | 60 | 1.13 - 76.26 | 11.87 | 17.45 |
| forest | | 14 | 4.02 - 40.46 | 10.61 | 25.58 |
| upslope | | 9 | 0.80 - 5.54 | 1.82 | 2.37 |
| road | | 2 | 4.04 - 6.50 | 5.27 | 6.50 |
| Bellingham, WA | Ecology & Environment 2002 | | | | |
| [Oeser Site background] | | | | | |
| residential (ND=1/2DL) | | 10 | 1.48 - 34.76 | 7.32 | 11.29 |
| residential (ND=0) | | 10 | 0.83 - 22.93 | 4.78 | 7.42 |
| open (ND=1/2DL) | | 10 | 0.70 - 4.11 | 2.22 | 2.75 |
| open (ND=0) | | 10 | 0.17 - 2.96 | 1.16 | 1.72 |
| Washington State Survey | Rogowski et al. 1999 | | | | |
| urban | Rogowski and Yake 2005 | 14 | 0.73 - 21.55 | 2.74 | 5.92 |
| forest | | 8 | 1.18 - 6.67 | 3.49 | 5.60 |
| open | | 8 | 0.69 - 5.18 | 1.47 | 2.31 |
| Denver, Colorado | USEPA, Region 8, 2001 | 38 | 0.21 - 42.71 | 2.17 | 7.92 |
| Davis County, Utah | University of Utah (undated) | 22 | 0.32 - 4.47 | 0.90 | 1.83 |
| Australia National Survey | Muller et al. 2004 | | | | |
| urban | | 27 | 0.11 - 45.33 | 4.18 | 10.74 |
| Trondheim, Norway | Andersson and Ottesen 2007 | 49 | 0.16 - 12.13 | 1.51 | 2.30 |
| | Andersson 2009 | | | | |
| US Survey | USEPA 2007 | | | | |
| rural soils | | 27 | 0.21 - 11.69 | 0.94 | 2.32 |
| Michigan | Demond et al. 2008 | | | | |

[7] "Dioxins, Furans, and other Contaminants in Surface Sediment and English Sole Collected from Greater Elliott Bay (Seattle)." See Table 1.
[8] Urban Seattle Area Soil Dioxin and PAH Concentrations Initial Summary Report. Available at **https://fortress.wa.gov/ecy/publications/publications/1109049.pdf**

| | | | | | |
|---|---|---|---|---|---|
| Jackson/Calhoun Counties | | | | | |
| house perimeter 0–1 inches | | 194 | 3–64.1 | 2.9 | 5.7 |
| house perimeter 1–6 inches | | 53 | 7–31.9 | 6.8 | 8.7 |
| garden | | 124 | 2–18.5 | 2.0 | 4.0 |
| Switzerland | | | | | |
| forest | Schmid et al. | 11 | 2.33–11.95 | 4.58 | 6.59 |

Note: All results are summarized based on 2005 WHO TEFs (Van den Berg et al. 2006), except for Utah results, which are as reported by the authors. Detailed congener results for the Utah samples were unavailable, precluding recalculation of TEQs. The individual sample results for Michigan are not reported, but the authors (Demond et al. 2008) report TEQs based on 2005 WHO TEFs. The statistical parameters for TEQ results for Michigan are as reported by the authors.

Ecology implies that the results of the screening study will inform the design of future sediment studies, as required for permitting of the Kenmore Navigation Channel (KNC). A more extensive and elaborate sampling design involving 'vibracore' sampling method will be used to determine whether material dredged from the KNC can be disposed in open water. The results of the screening level study indicate that dioxin levels in the upper 10 inches of sediment (i.e., the biologically active zone, and the depth of sediment sampled in the KNC), exceed the screening level threshold (4 parts per trillion; ppt) for safe disposal of dredged sediment in open water in Puget Sound established by a state and federal agency task force (the Dredged Material Management Program [DMMP] Agencies). The DMMP "screening level" standard is meant to protect human and ecological health.

In the north Lake Washington study, dioxin concentrations in 6 of the 8 samples collected in the KNC exceeded the DMMP Screening Level Threshold[9], and one sample exceeded the DMMP's Marine Maximum Threshold (10 ppt). Based on the median (4.6 ppt) and mean (5.5 ppt) dioxin concentration values, KNC, an urban area, is contaminated with dioxin to a greater extent than 90 percent of the non-urban areas of Puget Sound.[10]

## CONCLUSIONS AND RECOMMENDATIONS

Based on the above analysis, PERK draws the following conclusions and recommendations. An appendix is also provided to give relevant information to points made in this letter.

Clearly, KNC sediments are not at "natural background levels" – that is, capable of protecting normal ecological functions and components – as the Ecology Report claims. Ecology's definition of "natural background," is warped to produce a desired result, which is to be able to define human caused levels of contamination to be "natural." This is just manifestly untrue.

The following are our recommendations.

[9] The Ecology Report incorrectly states that "the channel results showed … one occurrence of dioxin exceeding the dredge DMMP screening guidance."

[10] Dredged Material Management Program Agencies. 2010. Dredged Material Management Program. New Interim Guidelines for Dioxins

1. Instead of comparing the screening level results to soil concentrations of dioxin, the report should reinterpret and describe the dioxin results in light of the DMMP standards and dioxin levels reported for other areas.

2. Immediate steps should be taken to restrict public use based on the Precautionary Principle, conduct further sampling in order to evaluate the full extent of contamination by dioxin and other carcinogens such as cPAH's, identify the potential sources of contaminants, and evaluate the risk they pose to human and environmental health.

3. Ecology cites the need to conduct further sampling to identify the dioxin source or sources, subject to the availability of additional funding. They vaguely promise to work together with the City of Kenmore and marina owners on dredge planning and environmental evaluation. Given the unequivocal evidence for elevated levels of dioxin, these assurances are unconvincing. Moreover, a specific plan should be developed and confirmed to determine the source or to clean up the areas where excessive contamination was found.

4. The source of the dioxins should be identified. DOE should statistically analyze the data and compare it with standards or data collected in other areas, such as Puget Sound.

5. Conduct a spatial analysis of the contamination that would assist in the determination of potential sources, evaluation of non-random variation in contaminant levels, and prediction of contaminant levels in un-sampled areas.

6. Ecology should accelerate efforts to develop Sediment Management Standards (SMS) for dioxin.

In conclusion, PERK requests that Ecology considers merits of above comments. We recognize that follow-up studies require time, effort, and money, and we welcome the opportunity to work with Ecology on our issues and recommendations, including development of sampling and analysis options and funding sources, Please direct future questions to the below signatories.

Thanks for the opportunity to comment.

PERK, People for an Environmentally Responsible Kenmore

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# APPENDIX: Studies and data supportive of PERK dioxin narrative

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**Dioxin concentrations reported Rayonier Mill Port Angeles Study**

From: Dioxins, Furans, and other Contaminants in Surface Sediment and English Sole Collected from Greater Elliott Bay (Seattle)

Mean Toxic Equivalents (TEQ) values for dioxins/furans for the 0-2 cm samples from Elliott Bay.

Table 7. TEQs for dioxins/furans in all 30 of the 0-2 cm sediment samples.

TEQs were calculated by multiplying a toxic equivalency factor by each individual result and summin
One-half the reporting limit was used in TEQ calculations if a congener was not detected.

| Summary Statistics | Total Dioxins (ng/kg TEQ) | Total Furans (ng/kg TEQ) | Total Dioxin/Furan (ng/kg TEQ) |
|---|---|---|---|
| Mean | 7.36 | 2.33 | 9.70 |
| Median | 5.84 | 1.81 | 7.67 |
| Minimum | 0.465 | 0.200 | 0.665 |
| Maximum | 23.3 | 5.56 | 26.6 |
| 90% CI Upper | 9.16 | 2.85 | 11.9 |
| 90% CI Lower | 5.56 | 1.82 | 7.44 |

CI – confidence interval

**Conclusion**: The mean TEQ concentration for the 30 north Lake Washington samples (12.5 ng/kg) was significantly higher than the mean (9.7 ng/kg) for the 0-2 cm sediment samples collected in Elliot Bay.

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From the Kenmore report:

**Table 9. Kenmore Area Sediment Results for Dioxin Compared with Ocean Survey Vessel Bold Puget Sound background sediment data -DMMP 2009.**

These results are all for sediments. However, the OSV Bold survey was conducted in Puget Sound, a marine setting in Washington. The sample locations were selected to focus on sediments that were outside the influence of known sources. More information on the sampling locations can be found at http://www.nws.usace.army.mil/Missions/CivilWorks/Dredging/Dioxin/PugetSoundPCBDioxinSurvey.aspx

| | | | | | | |
|---|---|---|---|---|---|---|
| Kenmore Area -30 results | 0.3 - 71 | 12.5 | 5 17% | 2 | 0 | 13 |
| Kenmore Area without marinas | 0.3 - 10 | 3.03 | 0 0% | 0 | 0 | Not applicable |
| **Puget Sound OSV Bold Samples** | | | | | | |
| Hood Canal (n=5) | 0.65 - 1.15 | 0.89 | 0 | 0 | 0 | 0 |
| Outer Sound[1] (n=15) | 0.26 - 1.74 | 0.74 | 0 | 0 | 0 | 0 |
| Inner Sound[2] (n=30) | 0.26 - 11.6 | 1.91 | 1 | 0 | 0 | 2 |
| Reference bays[3] (n= 20) | 0.24 - 5.15 | 1.13 | 0 | 0 | 0 | 1 |
| Total -70 results | 0.24 - 11.6 | 1.42 | 1 0% | | | |

*Ecology Draft April 30, 2013*

**Conclusion**: The mean TEQ concentration for the 30 north Lake Washington samples (12.5 ng/kg and 3.03 ng/kg with and without marina samples included) was significantly higher than the mean for all of the OSV areas sampled. *Non-parametric test should have been run.*

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From WDOE. 2011. Urban Seattle Area Soil Dioxin and PAH Concentrations Initial Summary Report. **https://fortress.wa.gov/ecy/publications/publications/1109049.pdf**

p. 1 Dioxin TEQ concentrations ranged from 1.7 to 110 nanograms per kilogram (ng/kg) with an average concentration of 19 ng/kg. The median and nonparametric 90th percentile concentrations were 12 and 46 ng/kg, respectively.

p. 12 Citywide, dioxin TEQ concentrations ranged from 1.66 to 114.65 ng/kg with an average concentration of 19.08 ng/kg. The median and nonparametric 90th percentile concentrations were 11.70 and 46.10 ng/kg, respectively.

Table 1 - Median and Average Carcinogenic PAH and Dioxin Toxicity Equivalent Concentrations

| Neighborhood | Median cPAH TEQ in ug/kg | Average cPAH TEQ in ug/kg | Median Dioxin TEQ in ng/kg | Average Dioxin TEQ in ng/kg |
|---|---|---|---|---|
| Ballard | 230 | 340 | 22 | 26 |
| Capitol Hill | 170 | 680 | 8.1 | 18 |
| Georgetown | 150 | 240 | 23 | 36 |
| Ravenna | 67 | 260 | 10 | 15 |
| South Park | 81 | 100 | 12 | 12 |
| West Seattle | 9.9 | 54 | 4.5 | 7.5 |
| All Areas | 84 | 260 | 12 | 19 |

Non-detected Results = 1/2 Detection Limit

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See: https://fortress.wa.gov/ecy/publications/publications/1109219.pdf

Rural samples - Dioxin levels in the soils from Washington state parks ranged from 0.15 - 9.4 ppt. The average concentration was 1.7 ppt.

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From Anchor report: The dioxin/furan TEQ exceeded the DMMP criteria in some samples. However, suitability for open-water disposal would be determined based on the volume-weighted average of dredged sediment using data collected as part of a full DMMP characterization.

A full DMMP characterization would be necessary to determine suitability for marine open water disposal closer to when dredging would occur.

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