

DREDGED MATERIAL MANAGEMENT PROGRAM

**DIOXIN/FURAN/PCB SAMPLING IN PUGET SOUND
Response to Public Comments on the Work Plan**

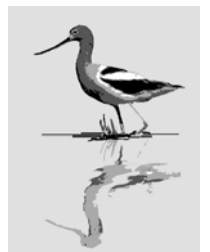
July 2008

Prepared for:

Seattle District Corps of Engineers
EPA Region 10
WA Dept. of Natural Resources
WA Dept. of Ecology

Prepared by:

Avocet Consulting
Olympia, WA USA
in conjunction with the DMMP agencies



Introduction

This document provides responses to comments on the Puget Sound Dioxin/Furan/PCB work plan distributed to the public on July 7, 2008. All comments were received by e-mail in response to a post on the Seattle District Corps of Engineers website and a mailing to interested parties. Comments are organized by commenter in alphabetical order by last name and numbered for easy reference. Responses to each comment are provided immediately after the comment.

Please note that since the work plan was originally developed, EPA Region 10 has offered to conduct analyses of the full suite of DMMP analytes at each station, for a variety of program purposes. This change is reflected in the revised Work Plan accompanying this response to comments.

B.J. Cummings **Duwamish River Cleanup Coalition (DRCC)**

DRCC-1. DRCC agrees that the existing dioxin/furan and PCB data available for Puget Sound is not adequate to support the many practical, regulatory and policy determinations necessary for implementing the DMMP program, Superfund/MTCA, and the Puget Sound Initiative. Overall, the Work Plan provides a reasonable and much needed sampling approach to address the stated study objectives and technical questions described in the document.

Response. *Thank you for your support. We agree that it will provide valuable and necessary information for making progress on the questions before the workgroup.*

DRCC-2. However, Question #3 includes a question that the sampling plan is not sufficient to address: "how all of these [reference] areas are interpreted relative to the various definitions of background used in the Model Toxics Control Act (MTCA) and the Washington State Sediment Management Standards (SMS)."

Response. *As a clarification, not all of the areas that will be sampled are existing or potentially future reference areas, which is a term used primarily for bioassay testing rather than for bioaccumulative compounds. The existing reference areas were selected for bioassay testing purposes and had certain criteria relating only to bioassays, and may or may not relate well to the areas that should be used to assess bioaccumulation. We chose to include the existing reference areas as part of the study to see how they compare to other areas of Puget Sound and to collect data in these reference areas for chemicals that have not been thoroughly sampled there. However, the line quoted above includes the other areas of Puget Sound as well, so should not have "reference" inserted into it.*

While it is true that the information provided by this study may not be sufficient to answer Question #3, it is certainly necessary as one of the pieces of information (technical, policy, and legal) needed to do so.

DRCC-3. While the sampling results will likely be useful in gaining a better understanding of "area-wide" or regional dioxin/furan and PCB concentrations, Puget Sound is the receiving water for numerous dioxin and PCB contaminated sites and sources both within Puget Sound and throughout the region. Collectively, these sources have likely contributed to contaminant levels throughout all of Puget Sound to varying degrees, not just to localized areas. It is unlikely that there is anywhere in Puget Sound that can be considered a true clean or "reference area" for these widespread chemicals.

While the sampling plan will be helpful in providing data to determine regional background levels, it will not provide data for determining "natural" or global background. The expectation that the results will contribute to a better understanding of "the various definitions of background" is therefore overstated, and suggests troubling expectations about how the data will be interpreted and applied in the practical, regulatory and policy realms. DRCC supports the sampling effort described, but is concerned about the implications regarding how the data will be interpreted and applied. The sampling plan and subsequent report should be very clear about the objectives in this regard, and clearly state the limitations of the proposed work plan.

Response. *The agencies are not yet prepared to comment on how the data may fit any particular definition of background. In part, it depends on the results of the study. In addition to Puget Sound, we are also sampling some areas that are expected to be outside the influence of urban bays in Puget Sound (e.g., Strait of Juan de Fuca and areas west and north of the San Juan Islands). It will be interesting to see whether any gradient observed is related to grain size/TOC or geographical/source characteristics. We can also do some literature reviews to evaluate how similar these data are to globally distributed concentrations. We are not making any assumptions about these outcomes prior to the study, and as it does not affect the design of the study or the questions we are hoping to answer, we prefer not to place any limitations on the possible uses of the data ahead of time.*

Tad Deshler
Windward Environmental

WW-1. Page 1, Question 1: It would be helpful to present a table with the dioxin/furan and Aroclor data referenced in this paragraph. Also, the nine reference locations should be identified here, perhaps as a footnote.

Response. Some of this information can already be found on the DMMP Dioxin Information website at:

http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DMMO&pageName=Dioxin_Work_Group

We did not include this in the work plan as it was clear that it was not enough information to base decisions on, and would not affect the design of the study. All of the dioxin/furan/PCB information from existing data, the recent dioxin/furan study in the vicinity of the disposal sites, and the current study will be provided and compared in the study report.

WW-2. Page 1, Question 1: While it is important to reach low enough detection limits, the last phrase in this paragraph is awkwardly phrased and isn't needed in this location.

Response. *The awkwardly-worded section has been revised to indicate that one of the reasons why PCB congener analysis was selected was that PCB Aroclor analysis typically has higher detection limits and results in a large number of non-detects.*

WW-3. Page 3, Objective 1: Why were these four reference areas selected? If only four of the eight (excluding Sequim Bay) reference areas are being sampled because of cost considerations, this should be stated explicitly.

Response. *There were four reference areas (Carr Inlet, Dabob Bay, Samish Bay, and Sequim Bay) initially established in the Interim Reference Area Performance Standards for Puget Sound (PTI 1989), and in 1991, Holmes Harbor was added to these (PSEP 1991). The exclusion of Sequim Bay results in the four areas included in this study. Cost was not a factor; consistency with the original Puget Sound Reference Area Study was the primary consideration.*

WW-4. Page 6, Section 3.3: Given the importance of the results from Methods 1613 and 1668, it is important that a reputable laboratory conduct the analyses and that stakeholders have a chance to review the laboratory selection. Since the laboratory is not specified in this work plan, will there be a later opportunity to review and comment on this element?

Response. *We agree that it is highly important that the selected laboratory meet the specified detection limits, and that the laboratory have a great deal of credibility with respect to quality control and timeliness. The project team worked closely with the EPA contract manager to ensure that the importance of these issues was foremost in the contracting process.*

Due to the compressed schedule of this project necessitated by the OSV Bold sampling schedule and the need to have results and decisions made before the 2009/2010 dredging season, there will not be an opportunity for stakeholders to review the selection of the laboratory. The laboratory for dioxin/furan/PCB

congener analysis has been selected and is SGS Environmental Services in Wilmington NC. The laboratory for standard DMMP analytes is still in the RFP process.

WW-5. Pages 8 and 9, Tables 1 and 2: The sources of the TEFs shown in these tables should be provided.

Response. *Sources for this information will be added.*

**Lisa Domenighini
NW Specialty Analytical Services**

NWSAS-1. Can you tell me if a laboratory has been selected for this work? If not is there a lab RFP that will go out to qualified laboratories?

Response. *The laboratory for dioxin/furan/PCB congener analysis has been selected and is SGS Environmental Services in Wilmington NC. The laboratory for standard DMMP analytes is still in the RFP process. The RFPs are being sent out through the standard CLP contracting process from EPA Region 10. If you are on that list and qualified for the analyses in question, you should automatically receive the RFP.*

**Larry Dunn
Lower Elwha Klallam Tribe**

LEKT-1. Why not deal with it in a relatively simple manner, starting from the outer embayments, moving in toward the center of the sound, look at the DMMP sites and draw a 20-mile radius around each of them, then sample the least developed bay within that circle. That should give you a reasonable background for each site which should statistically be out of the influence of the site itself. It should also address any bottom dwelling biota as far as range.

Response. *The sampling process you are describing would answer slightly different questions than we were asking. We are attempting to evaluate concentrations of these chemicals Puget Sound-wide, rather than identifying appropriate reference bays for each individual disposal site (those already exist). To take a broader look, we needed to cover more of Puget Sound in a relatively even manner, while still avoiding urban bays and known sources.*

LEKT-2. Before you chose the locations you should consult the tribes in which the site is within their Usual and Accustomed Fishing Area as to whether they agree that it is appropriate.

Response. *We expect that all, or nearly all, of the sampling sites will be within a Usual and Accustomed Fishing Area, as are most sites within Puget Sound. With this more comprehensive sampling design we hope to provide data for any area that a tribe or other entity might be interested in. Unfortunately, the compressed schedule of the OSV Bold did not allow for additional consultation with the tribes beyond the discussions with the NW Indian Fisheries Commission.*

Maggie Dutch

Puget Sound Ambient Monitoring Program

PSAMP-1. PCB Congener data exists for Puget Sound through the work of PSAMP: The DMMP work plan states in several places that “almost no data exist” in Puget Sound for PCB Congeners. This is untrue, as the PSAMP Sediment Component has collected data for 21 PCB congeners throughout Puget Sound since 1997. This congener data differs from data that the DMMP proposes to collect in this survey as follows: PSAMP has used EPA method 8082 (GC-ECD) to analyze sediments for 21 PCB congeners. The total PCB congener data is used for comparison with national ERL/ERM sediment quality criteria. DMMP intends to analyze sediment samples for all 209 PCB congeners using Method 1668 (HRGC/HRMS).

I realize that the DMMP intends to collect a very different suite of data to meet different objectives than those of PSAMP, but this draft document gives a very misleading impression to managers and stakeholders that this is the first time PCB data has been extensively collected throughout Puget Sound. This is not true, and the PSAMP Sediment Monitoring Team would appreciate it if this impression was not conveyed in the final draft of this document, or in future DMMP documents.

Response. *Your point is well taken, and the Work Plan will be revised accordingly. We regret having given a misleading impression of the status of PCB sampling in Puget Sound. We will make note of the differences between the respective analytical methods and related objectives.*

PSAMP-2. PSAMP has used an EPA random-stratified sampling design for sediment monitoring in Puget Sound since 2002 (NOAA design from 1997-1999): The DMMP proposes to place 5 random samples in each of 10 geographic strata to distribute samples evenly around Puget Sound. It's unfortunate that they didn't consult or communicate with the PSAMP sediment group about their random stratified sampling design. We have had an EPA-developed random, stratified sampling design in place for sampling sediments in Puget Sound since 2002 (and a NOAA-developed design in place from 1997-1999). The EPA-developed PSAMP design includes 8 geographically/oceanographically-based regions and a suite of random stations within each (over 1 million random stations are available within our Puget Sound sampling frame). We would be happy to share the

regional boundaries and random locations of our PSAMP design with the DMMP, rather than having them use a new design and choose new site locations. You may view details of the PSAMP Sediment Monitoring Component's sampling design and related work on our website:

<http://www.ecy.wa.gov/programs/eap/psamp/index.htm>,

<http://www.ecy.wa.gov/programs/eap/psamp/SpatialMon/Spatial.htm>

Response. *We appreciate this information and do agree that we should have coordinated more closely with PSAMP on the sampling design. The immediate need to prepare a work plan as quickly as possible (on the order of two weeks) precluded much of the coordination that we could have had with several organizations. However, upon review it is apparent that the PSAMP sampling regions do not include several of the areas we hope to sample, including areas outside Puget Sound proper where DMMP has dispersive disposal sites.*

PSAMP-3. Existing PSAMP sediment data should be used to augment the DMMP project: Using PSAMP's random, stratified sampling design, DMMP could choose to resample 6-7 PSAMP stations in the 8 regions. This would provide the DMMP with a wealth of physical and chemical sediment parameter information that was previously collected from these sites by PSAMP, and summary information regarding sediment quality for each of the 8 regions. Although PSAMP sampled from the 2-3 cm zone rather than the 10 cm zone, the existing 2-3 cm data would still provide information about each site, as well as summary sediment quality information (grain size, TOC, chemistry, toxicity) for each of the 8 regions.

Response. *The PSAMP data may indeed be very useful data for comparison and to provide context for these results once we receive them. Unfortunately, it is too late to change the sampling design substantially, and as noted above, some areas we hope to sample are not within the 8 PSAMP regions. Nevertheless, the PSAMP data will be critical to provide added information should we find any unexpected results, such as elevated chemical concentrations, in our samples. We do intend to analyze grain size, TOC, and standard analyte chemistry along with the dioxin/furan/PCB congener analyses, so will have this supporting data for these stations as well.*

PSAMP-4. Some proposed sampling locations may be unsampleable: Several of the proposed target stations identified in Figure 1 of the draft work plan are in locations in the eastern Strait of Juan de Fuca, Admiralty Inlet, and near the San Juan Islands. Ecology's Sediment Monitoring Team has had difficulty sampling these locations in the past due to the presence of numerous rocks and boulders on the seabed in these high current areas. We have severely damaged our van Veen grabs and spent a lot of ship time in the past unsuccessfully trying to sample these areas, and subsequently decided to restrict our sediment sampling frame in these 3 regions to bays and inlets, rather than open water. Since EPA will be borrowing the PSAMP van Veen grabs to conduct this work on the RV

Bold, we would like to request that they take care to protect the grabs when working in these areas (i.e., if you can't get a good sample on the first grab due to presence of rocks, then abandon the station).

We don't know who will be on the boat deploying the grabs, or how much experience they have in doing so. We tried to purchase a new grab at the end of the last biennium to have as a backup to the ones we use, and the company that made the ones was unresponsive to our phone calls and e-mails requesting a bid for new grab. We spoke with other vendors, but none had grabs that were identical in dimension to ours. We know that our grabs won't last forever, but the difficulty we've encountered in trying to get a replacement grab has given us renewed appreciation for keeping the ones we have in good working order.

Response. *We greatly appreciate PSAMP's concerns regarding potential damage to its sampling equipment, and will do everything possible to avoid such damage. Following PSAMP's recommendation, we have procured the use of a heavy-duty double van Veen from NOAA's Olympic Coast National Marine Sanctuary, which should provide better penetration in difficult substrate and avoid damage to PSAMP's lighter equipment. We also do have backup sampling locations should some areas prove to be difficult to sample (which we do expect).*

The sampling crew has a great deal of experience with sediment sampling, but in addition, at PSAMP's recommendation, Valerie Partridge of PSAMP/Ecology has been added to the sampling crew and is a very welcome addition to the project.

PSAMP-5. PSAMP's use of Cytochrome P450 RGS assay: From 1997-1999, the PSAMP Sediment Monitoring Team, in partnership with NOAA, conducted the Cytochrome P450 RGS assay on 300 samples throughout Puget Sound. This test was to act as a surrogate test to indicate sediments with high concentrations of dioxins/furans and coplanar PCBs. Dr. Jack Anderson, the creator of this test, analyzed a suite of samples collected for PSAMP for dioxins/furans and compared these data with the assay results. The data from the two tests were well correlated, indicating that the assay (about \$100/sample) was a good surrogate for the more expensive chemical analyses. Was this assay considered for this DMMP project?

Response. *As far as we are aware, the P450RGS assay is no longer commercially available in the US, as Columbia Analytical Services no longer supports the assay. The Army Corps lab in Vicksburg is the only lab running assays based on that cell line in the US. The Corps Seattle District and Ecology are working on obtaining funding and setting up a plan to include the 101L assay (aka P450RGS) in this project - this is an add on since the work plan was put out for public notice. This late addition was due in large part to the ERDC lab getting involved in the PCR-based assay, which requires a secondary cleanup to remove PCBs, so that this capability would now be available at the ERDC lab.*

The CALUX assay is very similar (another transgenic cell line, but based on a different cell culture), but more advanced than the old P450 RGS assay (more rapid turnaround, better QA/QC, separation of dioxin only versus dioxin + PCB TEQs).

Zena Hartung

ZH-1. I'd like to be notified of DMMP activity in our area (Budd Inlet). When is the sampling to be done?

Response. *The sampling will be conducted during the period July 31 – August 9. No sampling will be conducted within Budd Inlet, as that is considered an urban area. We will add you to the mailing list for this project.*

Roger McGinnis Hart Crowser, Inc.

HC-1. The work plan does not state how data evaluation will be performed. Specifically, will statistical evaluation be performed based on total toxic equivalents (TEQ) or on a congener-specific basis? For toxicity information and screening the TEQ approach would suffice however, information regarding potential dioxin sources and signatures would not be captured. Samples from different sources with vastly different signatures can often have the same TEQs.

Response. *All of the ways in which the data will be evaluated have not yet been identified; we have been focused instead on getting the sampling plan completed and preparing for the sampling. Our general intent is not to identify sources; instead, we are interested in areas away from known sources. For the purposes of this project we will determine total PCB and dioxin/furan concentrations with as low a detection limit as possible. For PCBs, we will have data permitting comparison of congeners, TEQ sums, and total PCBs to the more commonly used PCB Aroclor method.*

The dioxin/furan and PCB congener data will be made available to anyone who wishes to conduct an analysis for a specific project purpose, once quality assurance has been conducted and the data have been released by the agencies.

HC-2. The work plan indicates that analysis will be performed using the EPA Contract Laboratory Program (CLP). Historically, cost not technical expertise or experience, has been one of the primary considerations for accepting a laboratory into the CLP program. Will samples be analyzed by one well-recognized laboratory rather than be sent to multiple laboratories, which would increase the potential for confounding factors in the analytical results?

Response. *We agree that it is highly important that the selected laboratory meet specified detection limits and have a great deal of credibility with respect to quality control and timeliness. The project team worked closely with the EPA contract manager to ensure that the importance of these issues was foremost in the contracting process, rather than cost. The dioxin/furan/PCB congener samples will all be analyzed by a single laboratory, SGS Environmental Services in Wilmington, NC.*

HC-3. How will non-detects be treated in the statistical analysis? EPA has found that simple substitution of 0, one-half the MDL (or PQL), or use of the MDL/PQL for non-detects significantly biases sample results.

Response. *The project team is aware of this issue but has not yet made a decision. A statistical workshop will be held in September to obtain an expert consensus (if possible) on the best approach for addressing non-detects in the data set, and other related issues.*

HC-4. How will results that do not meet ion ratio identification criteria be treated? EPA Method 1613 states that results that do not meet ion ratio criteria should be reported as non-detected at the PQL. Many labs incorrectly use the Method 8290 reporting procedure where it is assumed dioxins are present and the estimated maximum possible concentration is reported. EPA Region 10 data validation guidance recommends rejecting data where ion ratios do not meet identification criteria.

Response. *EPA Region 10 will be conducting the data validation, and Ms. Ginna Grepo-Grove, the CLP project manager and data validator, has provided the following response: Region 10's approach to data validation for these results will be as follows: (1) for individual compounds - the target compound is qualified as non-detect, "U", with reporting limits elevated to the level of detection, (2) for totals - chromatograms and the quantitation lists for all homologue peaks and the m/z ratios are checked and totals calculations are verified to determine if the peaks with out-of-spec m/z ratios were included in the calculations. If they were, the totals are recalculated and the recalculated value is reported by the validator. TEQ values are also recalculated and reported. If the recalculated value is not reported, the totals and TEQ are qualified as estimated.*

Paul Seidel
OR Dept. of Environmental Quality

ORDEQ-1. The work plan calls for five stations in each of the identified strata. It is very likely that with five samples, it will not be possible to determine the underlying data distribution, and there will be considerable variability in the data-confounding efforts to correlate with other variables or to make comparisons between areas.

Response. *The strata were defined only for the purposes of sample placement. Each stratum will not be treated as an independent statistical distribution. As the work plan describes, the 4 reference strata will be combined into a distribution of 20 stations, and the 10 Puget Sound strata will be combined into a distribution of 50 stations. Technically, we could have generated random sampling locations for all 50 stations throughout Puget Sound, but we were trying to avoid the possibility that large areas of the Sound would not receive any stations, as sometimes happens with an entirely random sampling design.*

ORDEQ-2. As an alternative to get better quality, reproducible data that represents the true population mean within your strata, and at lower analytical cost, you should consider a multi-incremental (MIS) sampling strategy.

Response. *For individual strata, that might make sense, but as noted above, we are not retaining the strata as units for the analysis. With MIS sampling, station-wise heterogeneity is reduced and should approximate a normal distribution; this is appropriate for determining a distribution of means. However, we are interested also in the underlying distribution of concentrations. For example, with MIS, we would lose information on gradients, grain size/TOC correlations, or outliers that may be present. For a sample set of this size, it is believed that use of traditional statistics should be reasonable.*

ORDEQ-3. If outliers are removed for the data, it should only be done for an appropriate reason. If the laboratory quality assurance procedures are adequate, then a high outlier likely accurately represents what was processed through the laboratory instrumentation and should not be removed from subsequent analyses.

Response. *The purpose of this sampling effort is to define concentrations away from contaminated areas and sources, and it is possible there are some areas we do not know about, or did not identify or notice while designing the sampling plan. Should we obtain what appear to be anomalous concentrations for what should be a relatively low-concentration data set, we will look into sites and sources that may be present in the vicinity and/or use existing PSAMP or other monitoring data to look at the possibility that the station was influenced by one of the types of sources we were trying to avoid. In that case, the concentration would certainly be what the laboratory measured and would be a “real” concentration, but we might nevertheless choose to exclude it from a specific data distribution defined as reference or background.*

Mark Siipola
Portland District Corps of Engineers

PDCOE-1. It may be beyond this SAP, but there does not at this time seem to be a discussion as to the applicability of this effort to areas beyond the limits of Puget Sound. It seems that there should be some discussions as to the limit of this effort such as no sampling in any freshwater system. Will similar scale efforts be required for these freshwater systems or does it matter whether it is freshwater or saltwater?

Response. *There has not, to date, been discussion of the applicability of this DMMP workgroup process to areas outside of Puget Sound, including Grays Harbor and other coastal areas or freshwater areas. As you are aware, RSET is coordinating closely with the DMMP to ensure, to the degree schedules allow, compatible outcomes. Whether or not similar sampling would need to be done in freshwater systems could be the subject of future discussions in RSET. To a large degree, the number of samples DMMP is collecting was determined by the available budget and schedule, and would not necessarily be required in all areas.*

Should these concentrations represent globally-distributed concentrations, they could be expected to be similar to other non-urban areas. However, to the extent that they are affected by regional sources specific to Puget Sound, the data may have limited applicability to areas outside Puget Sound. As an example, once they reach the sediment-water system, PCBs and dioxins/furans should not behave substantially differently in marine systems than in freshwater systems, while others (e.g., metals and metalloids) may.

PDCOE-2. I suggest that salinity measurement be taken at the sampling stations or pore water along with TOC and grain size.

Response. *All of these sampling stations are located in marine waters outside of estuarine influences; therefore, salinity should be essentially uniform and the time and equipment required to sample porewater for each sample is probably not justified.*

References

PSEP. 1991. Reference Area Performance Standards for Puget Sound. Puget Sound Estuary Program, EPA Region 10, Seattle, WA, and Washington Department of Ecology, Olympia, WA.

PTI. 1989. Interim Performance Standards for Puget Sound Reference Areas. Prepared for Washington Department of Ecology Sediment Management Unit, Olympia, WA.