CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD February 12, 2003

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED FEDERAL OPERATION AND MAINTENANCE DREDGED MATERIAL FROM GRAYS HARBOR, WASHINGTON (*Public Notice CENWS OD-TS-NS-12*) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR OPEN-WATER DISPOSAL AT THE SOUTH JETTY OR POINT CHEHALIS DISPERSIVE SITES, OR AT SOUTH BEACH OR HALF MOON BAY BENEFICIAL USE SITES.

**1.** Introduction. The following summary reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) on the suitability of material from Grays Harbor, Washington (Figure 1) for unconfined open-water disposal. The requirements for determining the suitability of this material are documented in "*Dredged Material Evaluation Procedures and Disposal Site Management Manual, Grays Harbor and Willapa Bay, Washington"* (GHDMEP, 1995). As outlined in the GHDMEP, full sediment characterization of dredged material from the federal navigation channel is required on a rotating, biennial basis for the reaches of concern in the inner portions of Grays Harbor. Under this scenario, one third of the material dredged from the Crossover, North Channel, Hoquiam, Cow Point and South Aberdeen reaches of the Grays Harbor channel is characterized every two years, resulting in characterization of the entire inner portion every six years. In Grays Harbor, no contaminant testing is required for the outer reaches of the channel (Entrance, Bar, and South channels) per exclusionary criteria specified in Section 40 CFR 230.60 of the Clean Water Act. This exclusion is based on distance from known sources of contamination, generally coarse grain sizes and the high-energy environment of these outer channel areas.

For this project an estimated 1.86 million cubic yards (mcy) of maintenance material is proposed to be dredged annually from the upstream portions of the federal navigation channel. Approximately 1/3 of this material (600,000 cy) underwent GHDMEP sampling and testing in 2000, and another 1/3 was characterized as part of the current 2002 effort. The last 1/3 of the material will be tested in 2004 to complete the current six-year round of testing. Disposal is anticipated to be at the Point Chehalis and South Jetty estuarine sites or at beneficial use sites nearshore or onshore of South Beach or Half Moon Bay.

Table 1. Regulatory Tracking Dates

| | |
|---|---|
| SAP addendum received | MAY 16, 2002 |
| SAP approved | May 31, 2002 |
| Sampling dates | June 3-6, 2002 |
| Data report submitted | September 26, 2002 |
| DAIS Tracking Number | GRAYS-1-B-F-177 |
| Recency Determination: Low Concern (6 years) | June 2008 |

Table 2. Project Synopsis.

| | |
|---|---|
| Time of proposed dredging | Annually, February through August, except during fish windows |
| Proposed disposal sites | Point Chehalis and South Jetty open water dispersive sites;<br>Half Moon Bay and/or South Beach nearshore beneficial use sites, or HMB direct beach nourishment, as needed and approved. |
| Sediment ranking | low |
| Project last dredged | Annually |

**2.** Background. Dredging of the Grays Harbor navigation channel takes place annually to maintain the channel at the authorized depth. Characterization of this channel is not project specific, per the GHDMEP, but performed on a rotating basis. This approach characterizes the dredging volume over time rather than for a specific dredging event. The low rank of the area, and results from over a decade of sampling in the area continue to support this approach.

The second six-year rotation of sampling and testing based on the GHDMEP began in the year 2000. In order to plan holistically for this entire round of sampling, a programmatic sampling and analysis plan was prepared (Striplin 2000). This PSAP looked at historic dredging volumes in various reaches of the navigation channel and devised a strategy for insuring that the sampling adequately represented those volumes. A SAP addendum is prepared each year to address sampling issues specific to the given sampling and testing event.

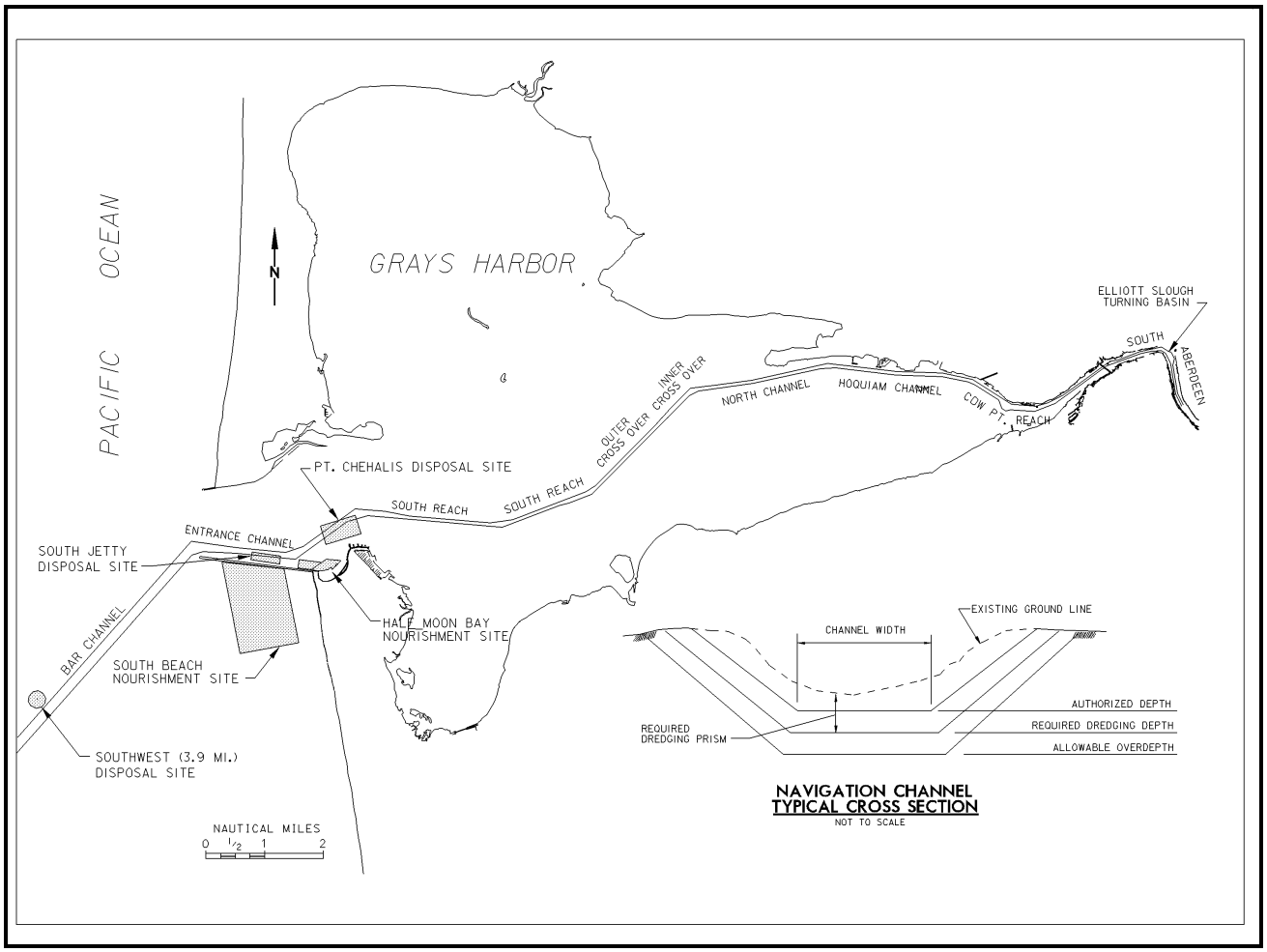


Figure 1. Grays Harbor navigation project. Samples in the 2002 characterization were from the Crossover Channel, North Channel & Hoquiam reaches.

**3.** Sampling. Sediment sampling took place from June 3 – 6, 2002. For the 2002 characterization, as in the past, the area was ranked "low," and the material available for dredging was considered homogenous. The approved programmatic and 2002 addendum sampling and analysis plans were followed, and quality assurance/quality control guidelines specified by the GHDMEP sampling and testing guidelines were generally complied with. The field

sampling effort included collection of 80 sediment grab samples for compositing into 10 dredged material management unit (DMMU) samples. Samples came from the middle portion of the navigation channel (including Crossover Channel, North Channel, and Hoquiam Reach). The sampling effort also included collection of reference sediment from the North Bay area of Grays Harbor in anticipation of performing confirmatory bioassays. Conventional parameters measured in these 10 DMMU samples are depicted in Table 3.

Table 3. Sediment conventional results.

| | | | | bioassays | | | | | | bioassays | | reference |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | GHS7 b |
| | Volume (cubic yards) | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 | -- |
| GRAIN SIZE | % Gravel | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.2 | 0.2 | 0.2 | 0.1 | 0.3 |
| | % Sand | 68.6 | 58.1 | 39.2 | 54.5 | 66.1 | 53.8 | 43.7 | 48.8 | 39.3 | 54.3 | 33.3 |
| | % Silt | 19.0 | 29.4 | 29.8 | 29.5 | 25.0 | 32.5 | 42.1 | 35.1 | 42.1 | 35.6 | 45.0 |
| | % Clay | 12.3 | 12.5 | 21.0 | 15.9 | 8.8 | 13.6 | 13.9 | 14.9 | 18.3 | 10 | 21.3 |
| | (clay+silt) % Fines | 31.3 | 41.9 | 50.8 | 45.4 | 33.8 | 46.1 | 56 | 50 | 60.4 | 45.6 | 66.3 |
| | Total Solids, % | 65.1 | 61.3 | 53.4 | 59.7 | 66.9 | 58.2 | 58.9 | 60.6 | 55.4 | 60.2 | -- |
| | Volatile Solids, % | 4.3 | 4.5 | 5.8 | 4.8 | 3.5 | 5.3 | 5.3 | 4.8 | 5.7 | 5.0 | |
| | Total Organic Carbon, % | 1.1 | 1.1 | 1.2 | 1.0 | 1.1 | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 | |
| | Total Sulfides, mg/kg | 30.0 | 300 | 120 | 16.0 | 3.9 | 1.90 | <1.70 | 7.90 | 79.0 | 420 | |
| | Total Ammonia, mg N/kg | 15 | 14 | 15 | 19 | 15 | 20 | 16 | 15 | 29 | 24 | |

Note: Grain-size data as reported by the laboratory were determined using a 74 micron sieve as the cutoff for percent fines. The laboratory recalculated the percent fines to determine what result would have been obtained using a 62.5 micron cutoff, the standard required for GHDMEP analyses. Only the recalculated values are shown here. All grain-size data finer than sand are qualified as estimated.

**4.** Chemical Analysis. The Agencies' approved sampling and analysis plan was followed, and quality assurance/quality control guidelines specified by PSEP and the DMMP program were generally complied with, except as noted below. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the GHDMEP program. Chemical analysis results (Table 4) demonstrated that all dredged material management units characterized showed no detected or nondetected chemical exceedances of DMMP screening levels.

The DMMP is presently developing an updated Bioaccumulative Chemicals of Concern (BCOC) List (Hoffman 2002). As part of this characterization, most BCOCs on "List 1" (primary concern), were analyzed in all 10 samples from the navigation channel. List 1 BCOCs analyzed for included alpha-benzene Hexachloride (alpha-BHC), anthracene, arsenic, benzo(a)anthracene, benzo(a)pyrene, cadmium, chlordane, chromium, copper, Total DDT (sum of 3 p,p' isomers), Endrin, fluoranthene, gamma-BHC /gamma-hexachlorocyclohexane, heptachlor, heptachlor epoxide, hexachlorobenzene, lead, mercury, nickel, pentachlorophenol, PCBs (total Aroclor), pyrene, selenium, silver, toxaphene and zinc. Many of these chemicals are already included in the GHDMEP standard list of analytes but will have bioaccumulation triggers reevaluated as part of the BCOC development process. List 1 chemicals excluded

from analysis, due to low reason-to-believe that these chemicals are of concern in the navigation channel, included parathion, tributyltin, and dioxins/furans.

The GHDMEP all suggests analysis of special "chemicals of concern" for the Grays Harbor area. These analyses are in addition to the suite of chemical analyses routinely required for DMMP testing. Guaiacols and resin acids were considered special COCs for this characterization. No guaiacols were detected in any sample. Low levels of three out of four resin acids were detected in some samples, but the levels detected were much lower than levels generally associated with environmental or human health effects.

**5.** Comparison to SMS Guidelines. All results of the chemical analyses were organic carbon normalized, if necessary, and compared to Washington State Sediment Management Standards. All detected chemicals were well below Sediment Quality Standards (SQS). However, non-detected levels of Hexachlorobenzene and 1,2,4-Trichlorobenzene exceeded SQS guidelines when normalized to organic carbon levels in all samples. This apparent exceedance was likely caused by the low organic carbon concentration as well as a general difficulty for achieving low detection limits for HCB. 1,2,4-Trichlorobenzene also met the CSL in several samples and exceeded it in one (see Table 4). The DMMP agencies agreed that there is no reason to believe that these non-detected chemicals are present at any level of concern. Thus, this analysis indicates that all sediments tested are suitable for beneficial uses under Washington State Sediment Management Standards.

Table 4. SMS detection limit exceedances

| | SMS | | DMMU | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARAMETER | SQS | CSL | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
| Total Organic Carbon (%) | -- | -- | 1.1 | 1.1 | 1.2 | 1.0 | 1.1 | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 |
| 1,2,4-Trichlorobenzene | 0.8 | 1.8 | 1.8 U | 1.8 U | 1.7 U | 2.0 U | 1.8 U | 1.8 U | 1.7 U | 1.7 U | 1.7 U | 1.7 U |
| Hexachlorobenzene | 0.4 | 2.3 | 1.8 U | 1.8 U | 1.7 U | 2.0 U | 1.8 U | 1.8 U | 1.7 U | 1.7 U | 1.7 U | 1.7 U |

Bolded values exceed SQS
Bolded and shaded values exceed SQS and CSL

**6.** Biological Testing. As stated above, there were no exceedances of DMMP guidelines for any DMMUs. In this case, according to the GHDMEP, two DMMU are chosen for safety net bioassay testing. For this characterization, composites C3 and C9 were chosen due to their high clay fractions, and because they are geographically separate. The standard suite of three bioassay tests (amphipod toxicity, larval mortality/abnormality, and *Neanthes* growth) were performed on the sediments chosen for safety-net testing.

Performance standards and interpretation guidelines specified in the GHDMEP were used to evaluate the bioassay data collected (Table 5). Reference sediments were collected from an approved Grays Harbor reference site at Station GHS7.

Control and reference sediments were within DMMP performance criteria for the all bioassays (Table 6). There were no one hit or two hit responses in any test (Table 5), and thus the safety-net bioassay passed all criteria for open-water disposal.

Table 5. Results of chemical analysis. List 1 Bioaccumulative Chemicals of Concern (BCOCs) are italicized.

| | GHDMEP | | | Crossover Channel | | | | | North Channel | | Hoquiam Reach | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Screening Level (SL) | Bioaccum-ulation Trigger (BT) | Maximum Level (ML) | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
| METALS (mg/kg, dry wt.) | | | | | | | | | | | | | |
| Antimony | --- | --- | --- | 8U | 8U | 10U | 8U | 7U | 9U | 9U | 20U | 9U | 9U |
| Arsenic | 57 | 507.1 | 700 | 8U | 8 | 10 | 9 | 9 | 9 | 11 | 20U | 9 | 9U |
| Cadmium | 5.1 | --- | 14 | 0.06 | 0.08 | 0.14 | 0.08 | 0.05 | 0.09 | 0.09 | 0.09 | 0.09 | 0.08U |
| Chromium | --- | --- | --- | 27.0 | 30.1 | 34.1 | 30.6 | 27.4 | 32.8 | 33.0 | 40.0 | 36.5 | 36.1 |
| Copper | 390 | --- | 1300 | 23.4 | 27.6 | 36.4 | 29.7 | 22.1 | 37.8 | 39.9 | 52.7 | 49.6 | 51.2 |
| Lead | 450 | --- | 1200 | 3.8 | 3.8 | 5.3 | 4.2 | 3.1 | 5.3 | 4.6 | 4.6 | 5.0 | 5.2 |
| Mercury | 0.41 | 1.5 | 2.3 | 0.08U | 0.08U | 0.07U | 0.09U | 0.07U | 0.08U | 0.09U | 0.07U | 0.08U | 0.08U |
| Nickel | --- | --- | --- | 19 | 20 | 23 | 21 | 19 | 23 | 24 | 32 | 26 | 31 |
| Silver | 6.1 | 6.1 | 8.4 | 0.5U | 0.5U | 0.6U | 0.5U | 0.4U | 0.5U | 0.5U | 1U | 0.5U | 0.5U |
| Zinc | 410 | --- | 3800 | 54 | 60.1 | 69 | 62 | 53.7 | 66 | 68 | 81 | 75 | 78 |
| ORGANICS (µg/kg, dry wt.) | | | | | | | | | | | | | |
| Total LPAHs | 5,200 | --- | 29,000 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 11MJ | 20U |
| Naphthalene | 2,100 | --- | 2,400 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Acenaphthylene | 560 | --- | 1,300 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Acenaphthene | 540 | --- | 3,600 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Fluorene | 1,500 | --- | 21,000 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Phenanthrene | 960 | --- | 13,000 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 11MJ | 20U |
| Anthracene | 500 | --- | 2,000 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| 2-Methylnaphthalene | 670 | --- | 1,900 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Total HPAHs | 12,000 | --- | 69,000 | 27J | 20U | 10J | 28J | 20U | 20U | 23J | 29J | 36J | 26J |
| Fluoranthene | 1,700 | 4,600 | 30,000 | 14J | 20U | 10J | 14J | 20U | 20U | 11J | 17J | 18J | 15J |
| Pyrene | 430 | --- | 7,300 | 13J | 20U | 20U | 14J | 20U | 20U | 12J | 12J | 18J | 11J |
| Benzo(a)anthracene | 1,300 | --- | 5,100 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Chrysene | 1,400 | --- | 21,000 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Benzo(b)fluoranthene | --- | --- | --- | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Benzo(k)fluoranthene | --- | --- | --- | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Benzofluoranthenes | 3,200 | --- | 9,900 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Benzo(a)pyrene | 1,600 | 3,600 | 3,600 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Indeno(1,2,3-cd)pyrene | 600 | --- | 4,400 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Dibenz(a,h)anthracene | 230 | --- | 1,900 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Benzo(g,h,i)perylene | 670 | --- | 3,200 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| CHLORINATED HYDROCARBONS (µg/kg, dry wt.) | | | | | | | | | | | | | |
| 1,4-Dichlorobenzene | 110 | 120 | 120 | 1.3U | 2.1U | 1.8U | 1.5U | 1.5U | 1.4U | 1.4U | 1.7U | 2.0U | 2.1U |
| 1,2-Dichlorobenzene | 35 | 37 | 110 | 1.3U | 2.1U | 1.8U | 1.5U | 1.5U | 1.4U | 1.4U | 1.7U | 2.0U | 2.1U |
| 1,2,4-Trichlorobenzene | 31 | --- | 64 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Hexachlorobenzene | 22 | 168 | 230 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| 1,3-Dichlorobenzene | 170 | 1,241 | --- | 1.3U | 2.1U | 1.8U | 1.5U | 1.5U | 1.4U | 1.4U | 1.7U | 2.0U | 2.1U |
| PHTHALATES (µg/kg, dry wt.) | | | | | | | | | | | | | |
| Dimethyl phthalate | 1,400 | 1,400 | --- | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Diethyl phthalate | 1,200 | --- | --- | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Di-n-butyl phthalate | 5,100 | 10,220 | --- | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Butylbenzyl phthalate | 970 | --- | --- | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| bis(2-Ethylhexyl) phthalate | 8,300 | 13,870 | --- | 20U | 20U | 23B | 30B | 20U | 22B | 20U | 81B | 25B | 20U |
| Di-n-Octyl phthalate | 6,200 | --- | --- | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| PHENOLS (µg/kg, dry wt.) | | | | | | | | | | | | | |
| Phenol | 420 | --- | 1,200 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| 2-Methylphenol | 63 | --- | 77 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| 4-Methylphenol | 670 | --- | 3,600 | 51 | 20U | 18MJ | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| 2,4-Dimethylphenol | 29 | --- | 210 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Pentachlorophenol | 400 | --- | 690 | 99U | 98U | 100U | 99U | 99U | 99U | 98U | 99U | 99U | 100U |

Table 4, cont.

| | GHDMEP | | | Crossover Channel | | | | | North Channel | | Hoquiam Reach | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Screening Level (SL) | Bioaccum-ulation Trigger (BT) | Maximum Level (ML) | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
| MISC. EXTRACTABLES (µg/kg, dry wt.) | | | | | | | | | | | | | |
| Benzyl Alcohol | 57 | --- | 870 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Benzoic Acid | 650 | --- | 760 | 200U | 200U | 200U | 200U | 200U | 200U | 200U | 200U | 200U | 200U |
| Dibenzofuran | 540 | --- | 1,700 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Hexachlorobutadiene | 29 | --- | 270 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| N-Nitrosodiphenylamine | 28 | --- | 130 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| Hexachloroethane | 1,400 | --- | 14,000 | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U | 20U |
| GUAIACOLS (µg/kg, dry wt.) | | | | | | | | | | | | | |
| Guaiacols | --- | --- | --- | 40U | 39U | 40U | 40U | 40U | 40U | 39U | 40U | 39U | 40U |
| 4,5,6-Trichloroguaiacol | --- | --- | --- | 99U | 98U | 100U | 99U | 99U | 99U | 98U | 99U | 98U | 100U |
| 3,4,5-Trichloroguaiacol | --- | --- | --- | 150U | 150U | 150U | 150U | 150U | 150U | 150U | 150U | 150U | 150U |
| Tetrachloroguaiacol | --- | --- | --- | 150U | 150U | 150U | 150U | 150U | 150U | 150U | 150U | 150U | 150U |
| RESIN ACIDS (µg/kg, dry wt.) | | | | | | | | | | | | | |
| Pimaric acid | --- | --- | --- | 30U | 29U | 30U | 30U | 30U | 30U | 29U | 30U | 30U | 30U |
| Sandacopimaric acid | --- | --- | --- | 40U | 39U | 40U | 40U | 40U | 40U | 39U | 40U | 39U | 30J |
| Isopimaric acid | --- | --- | --- | 22MJ | 18MJ | 26J | 44M | 16J | 30 | 26J | 23J | 47 | 140 |
| Dehydroabietic acid | --- | --- | --- | 50 | 39 | 57 | 240 | 21J | 48 | 40 | 47 | 67 | 150 |
| Abietic acid | --- | --- | --- | 230J | 200J | 240J | 410 | 160J | 340 | 280J | 220J | 510 | 1,100 |
| Dichlorodehydroabietic acid | --- | --- | --- | 40U | 39U | 40U | 40U | 40U | 40U | 39U | 40U | 39U | 40U |
| PESTICIDES AND PCBS (µg/kg, dry wt.) | | | | | | | | | | | | | |
| 4,4'-DDE | --- | --- | --- | 0.79U | 0.78U | 0.80U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.80U |
| 4,4'-DDD | --- | --- | --- | 0.79U | 0.78U | 0.80U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.80U |
| 4,4'-DDT | --- | --- | --- | 0.79U | 0.78U | 0.80U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.80U |
| Total DDT | 6.9 | 50 | 69 | 0.79U | 0.78U | 0.80U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.80U |
| Aldrin | 10 | 37 | --- | 0.40U | 0.39U | 0.40U | 0.40U | 0.40U | 0.40U | 0.39U | 0.40U | 0.39U | 0.40U |
| Chlordane | 10 | 37 | --- | 0.40U | 0.39U | 0.40U | 0.40U | 0.40U | 0.40U | 0.39U | 0.40U | 0.39U | 0.40U |
| Dieldrin | 10 | 37 | --- | 0.79U | 0.78U | 0.80U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.80U |
| Heptachlor | 10 | 37 | --- | 0.40U | 0.39U | 0.40U | 0.40U | 0.40U | 0.40U | 0.39U | 0.40U | 0.39U | 0.40U |
| Gamma-BHC (Lindane) | 10 | --- | --- | 0.40U | 0.39U | 0.40U | 0.40U | 0.40U | 0.40U | 0.39U | 0.40U | 0.39U | 0.40U |
| Aroclor 1016 | --- | --- | --- | 7.9U | 7.8U | 8.0U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 8.0U |
| Aroclor 1242 | --- | --- | --- | 7.9U | 7.8U | 8.0U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 8.0U |
| Aroclor 1248 | --- | --- | --- | 7.9U | 7.8U | 8.0U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 8.0U |
| Aroclor 1254 | --- | --- | --- | 7.9U | 7.8U | 8.0U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 8.0U |
| Aroclor 1260 | --- | --- | --- | 7.9U | 7.8U | 8.0U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 8.0U |
| Aroclor 1221 | --- | --- | --- | 16U | 16U | 16U | 16U | 16U | 16U | 16U | 16U | 16U | 16.0U |
| Aroclor 1232 | --- | --- | --- | 7.9U | 7.8U | 8.0U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 7.9U | 8.0U |
| Total PCBs | 130 | 38 mg/kg TOC | 2,500 | 16U | 16U | 16.0U | 16U | 16U | 16U | 16U | 16U | 16U | 16.0U |
| NEW BCOCs (dry wt.) | | | | | | | | | | | | | |
| Heptachlor epoxide (µg/kg) | --- | --- | --- | 0.40U | 0.39U | 0.40U | 0.40U | 0.40U | 0.40U | 0.39U | 0.40U | 0.39U | 0.40U |
| Endrin (µg/kg) | --- | --- | --- | 0.79U | 0.78U | 0.78U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.79U | 0.80U |
| Selenium (mg/kg) | --- | --- | --- | 0.3U | 0.3U | 0.4U | 0.4U | 0.3U | 0.4U | 0.3U | 0.3U | 0.4U | 0.3U |
| Toxaphene (µg/kg) | --- | --- | --- | 40U | 39U | 40U | 40U | 40U | 40U | 39U | 40U | 39U | 40U |
| Alpha-BHC (µg/kg) | --- | --- | --- | 0.40U | 0.39U | 0.40U | 0.40U | 0.40U | 0.40U | 0.39U | 0.40U | 0.39U | 0.40U |

U - Chemical was undetected at the reported concentration.
J - Estimated concentration when the value is less than the calculated reporting limit.
M - Estimated value of analyte found and confirmed by analyst but with low spectral match.
B - Indicates possible/probable blank contamination.

## 7. QA/QC.

| QA ELEMENT | | WARNING LIMITS | ACTION LIMITS |
|---|---|---|---|
| Precision | Metals | None | 20% RPD or COV |
| | Organics | 35% COV | 50% COV or a factor of 2 for duplicates |
| Matrix Spikes | Metals | None | 75-125% recovery |
| | Organics:[1]<br>▪ Volatiles<br>▪ Semivolatiles and Pesticides | ▪ 70-150%<br>▪ 50-150% | None (zero percent recovery may be cause for data rejection however)[2] |
| Reference Materials | Metals | None | 95% CI if specified for a particular CRM; 80-120% recovery if not. |
| | Organics | None | 95% CI for CRMs. No action limit for uncertified RMs. |
| Surrogate Spikes | Organics<br>▪ Volatiles<br>▪ Pesticides<br>▪ Semi-volatiles | ▪ 85% minimum recovery<br>▪ 60% minimum recovery<br>▪ 50% minimum recovery | EPA CLP chemical-specific recovery limits |

Table 5. Bioassay results summary.

| STATION | GRAIN SIZE | | AMPHIPOD (Eohaustorius) MORTALITY (%) | | SEDIMENT LARVAL (Mytilus) NCMA (%) | | 20-DAY NEANTHES GROWTH Survival (%) | Growth (mg/ind/day) 0.5 mg initial wt. | | Growth % of ref. | DMMP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | % fines | % clay | mean | sd | mean | sd | | mean | sd | | |
| Control | -- | -- | 0.0 | 0.0 | n/a | n/a | 100 | 1.05 | 0.22 | 122.1% | |
| Reference GHS7 b | 66.3 | 21.3 | 0.0 | 0.0 | 3.9 | 4.3 | 100 | 0.86 | 0.18 | na | |
| C3 | 50.8 | 21.0 | 1.0 | 2.2 | 10.5 | 4.2 | 100 | 1.02 | 0.20 | 118.6% | pass |
| C9 | 60.4 | 18.3 | 1.0 | 2.2 | 12.6 | 4.9 | 100 | 0.79 | 0.09 | 91.9% | pass |
| Reference toxicant | | | Cadmium chloride, 96 hr. LC50, 2.08 mg/L Cd | | Copper sulfate, 48 hr EC50, 9.94 mg/L Cu | | Cadmium chloride, 96 hr. LC50, 9.27 mg/L Cd | | | | |
| Lab Control limits | | | 0.67 - 3.86 mg/L Cd | | 8.50 - 12.6 ug/L Cu | | 4.20 - 11.6 mg/L Cd | | | | |

1 Warning limits set at the CLP advisory limits for matrix spike duplicates for those chemicals covered under CLP.
2 Rigorous control limits are not recommended due to possible matrix effects and interferences.

Table 6. Bioassay performance summary.

| Bioassay | Negative Control Performance Standard | Reference Sediment Performance Standard |
|---|---|---|
| Amphipod | 0% mortality ≤ 10%; pass | 0% ref. mortality – 0% control mortality ≤ 20%; pass |
| Larval | 6% CMA ≤ 30%; pass | 3.9% NCMA = ≤ 35%; pass |
| Neanthes growth | 0% mortality ≤ 10%; pass | 82% ref. MIGR ≥ 80% control MIGR; pass |

CMA = Combined mortality and abnormality
NCMA = Normalized combined mortality and abnormality (normalized to seawater control)
MIGR – mean individual growth rate

**8.** Suitability. This memorandum documents the suitability of all proposed dredged sediments in the Grays Harbor navigation channel for open water disposal. Based on the results of the chemical and biological testing and the discussions above, the DMMP agencies concluded that the total dredging volume of 1.86 million cubic yards is suitable for open water disposal. Open water disposal may be at the South Jetty or Point Chehalis estuarine disposal site, or at an approved beneficial use (nearshore or onshore) site

This determination of suitability does not constitute final agency approval of the project. During the public comment period that follows a public notice, the resource agencies and public will provide input on the overall project. A final project decision will be made after full consideration of agency and public input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

**9.** References.

Hoffman, Erika. 2002. Proposed revisions to the Bioaccumulative contaminants of concern (BCOC) list. Dredged Material Management Program Issue Paper. Presented at: Sediment Management Annual Review Meeting, May 2002. US Environmental Protection Agency, Region 10.

Striplin Environmental Associates, Inc. 2002. Data Report: Sediment characterization for Grays Harbor maintenance dredging, FY 2002 – Grays Harbor, Washington. Draft report submitted to Seattle District, US Army Corps of Engineers, September 23, 2002.

Striplin Environmental Associates, Inc. 2000. Programmatic Sampling and Analysis Plan: Sediment characterization for Grays Harbor Maintenance Dredging, FY 2000 – 2006. Prepared for the Seattle District, US Army Corps of Engineers, 7 July 2000.

Concur:

The signed document is on file in the Dredged Material Management Office.

| | |
|---|---|
| Date | Lauran Cole Warner, Seattle District Corps of Engineers |
| Date | Justine Barton, Environmental Protection Agency |
| Date | Tom Gries, Washington Department of Ecology |
| Date | Peter Leon, Washington Department of Natural Resources |

Copied furnished:

George Hart, Corps
Hiram Arden, Corps
Loree' Randall, Ecology
Justine Barton, EPA
Peter Leon, DNR
Quinault Tribe
DMMO file