

SUBJECT: SUPPLEMENTAL DETERMINATION ON THE SUITABILITY OF A SUBSET OF DREDGED MATERIAL PREVIOUSLY CHARACTERIZED FOR THE EAST WATERWAY/STAGE II PROJECT AND LOCATED AT THE PORT OF SEATTLE'S T-30 BERTHING AREA (PN#2001-2-00635). THIS EVALUATION WAS DONE UNDER SECTION 404 OF THE CLEAN WATER ACT FOR THE PURPOSE OF DETERMINING THE SUITABILITY OF THE DREDGED MATERIAL FOR OPEN-WATER DISPOSAL AT THE ELLIOTT BAY DISPOSAL SITE.

1. This Memorandum supplements the final suitability determination dated November 2, 1999 for the Stage II project, as sponsored jointly by the Corps of Engineers and the Port of Seattle. It reflects the consensus determination of the Dredged Material Management Program (DMMP) which consists of the principal agencies having jurisdiction for dredge/disposal projects in Washington State (i.e., the Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency). This supplemental determination reaffirms the suitability of an estimated 19,500 cys of dredged material tested in the Terminal-30 berthing area for unconfined open-water disposal at the Elliott Bay disposal site. The dredging proposed is the minimum needed to provide navigational access at T-30.
2. The subset of dredged material addressed in this memorandum was previously characterized per the DMMP process and the suitability decision of November 2, 1999. The pertinent data from that evaluation are presented in this memorandum. The proposed dredging volume of 19,500 cys is contained within the larger testing footprint characterized for the Stage II project (see Figure 1). The design depth for the proposed interim Terminal 30 dredging project is -44 feet MLLW + 1 foot of overdepth dredging.
3. This memorandum focuses on the sampling/testing results for 11 surface Dredged Material Management Units (DMMUs) and 5 subsurface DMMUs obtained within or adjacent to T-30. The total volume of sediment characterized represented by these DMMUs is 101,270 cys (see Table 2) out of a total Phase II dredging footprint of 618,120 cys. At this time, the volume of sediment proposed to be dredged at T-30 is only 19,500 cys, as depicted in Figure 1. All of the Phase II sediment was ranked high for purposes of testing. The sampling of the DMMUs consisted of collecting one uncomposited vibracore sample from each of the eleven surface DMMUs and three samples from each of the five subsurface DMMUs.
4. The sampling and analysis plan for testing the sixteen DMMUs was approved by the DMMP. Sampling and analysis was conducted according to the plan and quality assurance/quality control guidelines were generally complied with, as specified in the Puget Sound Dredged Disposal Analysis Users Manual. The data gathered were deemed sufficient and acceptable for decision making by the DMMP agencies based on best professional judgment.
5. Relevant dates for regulatory tracking purposes are included in Table 1.

Table 1. Regulatory Tracking Dates

Phase 1: Initial SAP Approval date:	July 26, 1998
Phase 2: Bioaccumulation retest SAP Approval date:	February 18, 1999
Phase 1: Initial Sampling date(s):	July 27 to 28 August 1998
Phase 2: Bioaccumulation resampling date(s):	March 29 to 9 April 1999
Phase 1: East Waterway Stage II Chemical/Bioassay Data report submittal date:	March 20, 1999
Phase 2: Bioaccumulation Data submittal date:	September 2, 1999
Recency Determination Date: High (2 years)	(see paragraph 16)
Phase 1	August 2000
Phase 2	April 2001

6. Table 2 summarizes the sediment conventional, chemical, and biological testing results for the eleven uncomposited surface DMMUs and five composited subsurface DMMUs analyzed. Four of the surface DMMUs and three of the subsurface DMMUs had no detected or undetected screening level (SL) exceedances. The remaining eight DMMUs had SL exceedances for TBT, Hg, Zinc, Fluoranthene, Pyrene, 2,4-dimethylphenol, and total PCBs. Bioaccumulation triggers for TBT were exceeded by 4 DMMUs (S40, S41, S43, S57). There were no maximum level chemical guideline exceedances among the sixteen DMMUs. Concurrent bioassay toxicity testing was accomplished for all sixteen DMMUs, and these results are summarized below.
7. Table 2 depicts the batch specific biological toxicity testing outcome summary for each of the sixteen DMMUs. Negative control and reference sediments met the performance limits for each of the three bioassays used to assess toxicity. The results indicated that no toxicity was expressed for either the amphipod bioassay or the 20-day *Neanthes* growth bioassay among the sixteen DMMUs. Twelve of sixteen sediment bivalve larval bioassays had a two-hit response, but there were no corresponding hits for the other two bioassays so all the DMMUs passed the nondispersive disposal site guidelines, including the four DMMUs with TBT bioaccumulation trigger exceedances. Therefore, these four DMMUs were subject to a 45 day bioaccumulation test to assess TBT. The results of these analyses are discussed below.

Bioaccumulation Testing:

8. Bioaccumulation testing was performed with *Macoma nasuta*, a facultative deposit feeding/suspension feeding bivalve and *Nephtys caecoides*, a burrowing facultative deposit feeding/carnivorous polychaete. The two species were tested together in the same 8-gallon aquaria. The standard PSDDA bioaccumulation test duration is 28 days. However, to provide a better approximation of steady-state tissue concentrations for the tested chemical (TBT), the applicant (Corps of Engineers/Port of Seattle) agreed to extend the exposure period to 45 days based on the recommendation of the DMMP agencies. The actual test was terminated at 44 days due to an increased rate of mortalities among the test species near the end of the test period.
9. Five replicate 8-gallon aquaria were run for the negative control, for each of the 2 reference sediments and for each of the 4 tested DMMUs.

Tissue Chemistry:

10. TBT tissue concentrations from the 44-day exposures were compared statistically to the appropriate reference sediment, based on grain size similarity comparisons. The calculated ratios of Phase I (initial)/Phase II (retest) sediment chemistry were used to adjust the observed tissue concentrations (Table 3). Statistical comparisons of test DMMUs and reference tissue concentrations for the final interpretation “worst case” analyses were based on the adjusted tissue concentrations. The summary tissue chemistry interpretation for each of the measured chemicals is provided in Table 4 for each of the 4 DMMUs tested.

Bioaccumulation Interpretation:

11. The DMMP agencies agreed that comparing statistical differences from reference is a necessary, but not sufficient condition to determine if a DMMU is unsuitable for open-water disposal. For those DMMUs that were statistically greater than reference, a more in-depth evaluation was required to determine the significance of the bioaccumulation that had occurred. This evaluation focused on **a)** Food and Drug Administration (FDA) Action Levels for Poisonous and Deleterious Substances in Fish and Shellfish for Human Food; **b)** PSDDA target tissue concentration values for chemicals of concern to human health, and **c)** ecological residue-effects data from the literature.

- a) **The FDA guidelines** and PSDDA target tissue concentration values for chemicals of concern to human health for bioaccumulation testing are as follows:

Tributyltin (TBT): No human health guideline

- b) **Ecological residue-effects.** A recent effort by the Port of Seattle (May 1999)¹ involved compilation of the residue-effect literature for TBT. It was prepared for the Port of Seattle by EVS Solutions for submittal to the U.S. Environmental Protection Agency for the Harbor Island Superfund Site, Waterway Sediment Operable Unit. Using residue-effects data from this and other studies, EPA Superfund developed a tissue trigger level of 3 ppm dry weight of TBT in tissue (0.6 ppm wet weight) that was used to evaluate bioaccumulation data from the West Waterway OU (for more information see Appendix D of the May 1999 EVS report). This tissue concentration is protective for growth and reproduction endpoints in polychaetes, crustaceans, bivalves, and most gastropods. However, it might not protect the most sensitive species of meso- and neogastropods against imposex-related sterility. Considering that meso- and neogastropods are rare in Elliott Bay (Appendix D in EVS, 1999), the DMMP agencies have decided to use the West Waterway **TBT trigger level (3 ppm dry weight)** as an interim target tissue level (TTL) to interpret bioaccumulation relative to disposal at the Elliott Bay site.

12. To summarize, the DMMP agencies will use the following TTL to interpret the bioaccumulation test data for the four DMMUs tested within the T-30 dredging footprint:

TBT: 3.0 ppm dry weight (dw) as TBT

13. The agencies used best professional judgement in developing the TBT interpretation guidelines to meet PSDDA disposal site management objectives; achievement of other sediment management objectives will require additional evaluation. These guidelines are subject to change for future PSDDA/DMMP projects as additional bioaccumulation data become available.
14. Each DMMU was compared to these interpretation guidelines using a one-tailed one-sample t-test (Table 4). An alpha level (the probability of making a Type I error, rejecting the null hypothesis of no difference between test and reference responses when, in fact, they are not different) of 0.1 was selected for these statistical comparisons by the DMMP agencies to reflect the higher within sample variability, and to increase the power of the test to discriminate between reference and test responses. All four DMMUs were statistically lower than the TTL, and therefore were deemed suitable for unconfined open-water disposal. In summary, all four DMMUs tested passed the bioaccumulation TTLs and thus passed open-water disposal guidelines.
15. The agencies concluded that all sixteen DMMUs representing a total of 101,270 cy are suitable for unconfined open-water disposal. Therefore, the subset of surface sediment proposed to be dredged at T-30 (19,500 cys) is reaffirmed to be suitable for unconfined open-water disposal.
16. The two year recency dates applicable to the existing data (see Table 2) are August 2000 for most DMMU and April 2001 for those DMMU undergoing bioaccumulation testing. As noted in the Evaluation

¹ For TBT, the DMMP agencies relied upon Appendix D of a May 1999 report entitled: "Review of Tissue Residue Effects Data for Tributyltin, Mercury, and Polychlorinated Biphenyls". Prepared by EVS Solutions for the Port of Seattle.

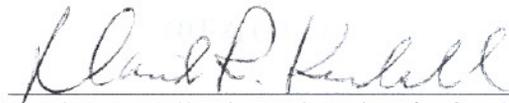
Procedures Technical Appendix under Section 3.2.2, the recency guidelines are intended to be reference dates to trigger the regulatory (DMMP) agencies' reconsideration of the applicability/representativeness of data from an area. The DMMP agencies reassessed the initial sediment quality data relevant to the subject project and reaffirmed the initial finding of suitability (see 15 above). There was some concern that dredged material escaping from the Terminal 18 dredging project might have contaminated the surface in the vicinity of Terminal 30. The agencies therefore considered more recent data collected at two Terminal-18 post-dredging monitoring stations (PDM-07 and PDM-09) located approximately 200 feet and 150 feet respectively from the proposed project dredging site (sampled between December 1999 and February 2000).

These two surface grabs indicated no exceedances of PSDDA chemicals of concern, including TBT, Hg, LPAHs, HPAHs, DDT, and PCBs. These data support the likelihood that contaminated dredged material from the Terminal 18 project did not move into the vicinity of Terminal 30, and that there has not been a significant change in the sediment quality of the surface sediments in the proposed dredging area. In addition, no spills or other potential sources of recent contamination have been identified in the project vicinity. Based on these findings, the DMMP agencies, using best professional judgement, conclude that the data for this project can be considered representative for the project through March 2002.

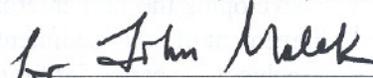
17. This memorandum reaffirms the suitability of a subset of the sediment to be dredged at Terminal 30 for disposal at the Elliott Bay non-dispersive open-water disposal site. However, this suitability determination does not constitute final agency approval of the project. A dredging plan for this project must be completed as part of the final project approval process. This will be especially important as unsuitable DMMUs are located immediately adjacent to the proposed prism (eg., S25, S26, and S45). A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under Section 404(b)(1) of the Clean Water Act.

Concur:

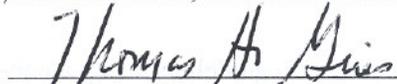
12 July 2001
Date


David Kendall, Ph.D., Seattle District Corps of Engineers

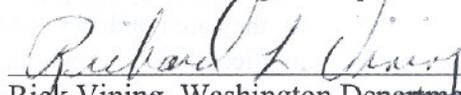
12 July 2001
Date

for 
Justine Barton, Environmental Protection Agency

07/12/01
Date


Tom Gries, Washington Department of Ecology

7/12/01
Date


Rick Vining, Washington Department of Ecology

12 July 01
Date


Robert Brenner, Washington Department of Natural Resources

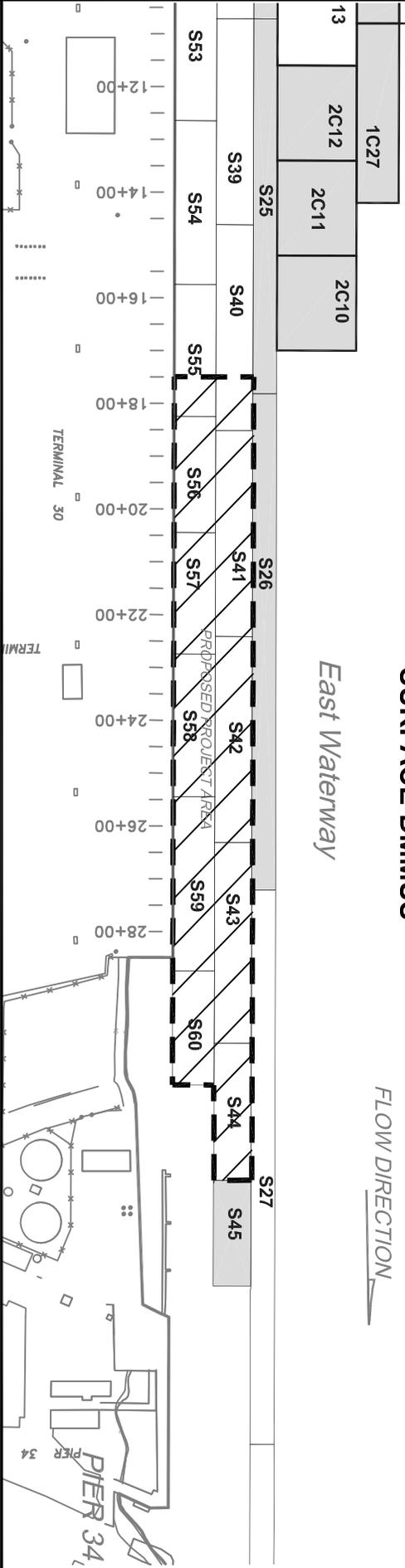
Copies Furnished:

Olivia Romano, Corps Regulatory Branch Project Manager
Justine Barton, EPA
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Robert Brenner, DNR
DMMO File

SURFACE DIMMUS

East Waterway

FLOW DIRECTION



NOTE
1. Basemap provided by the Port of Seattle.

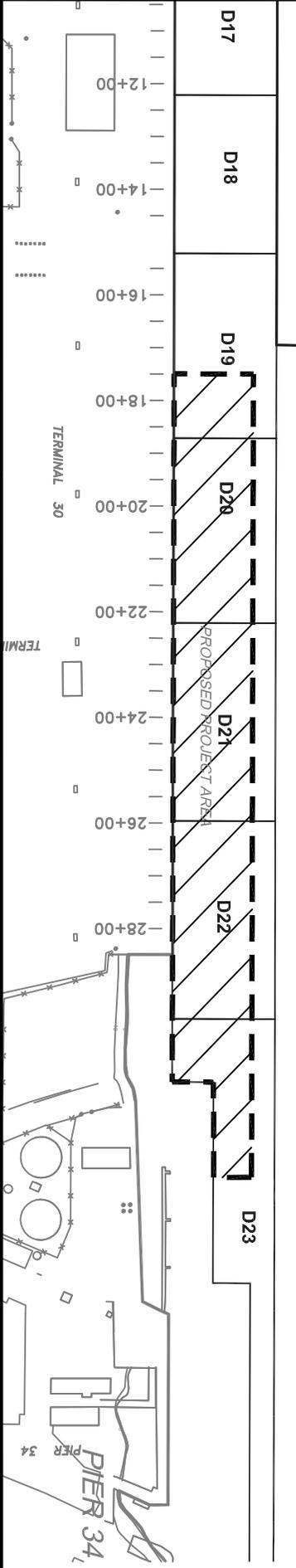
LEGEND

DIMMU NOT SUITABLE FOR PSDDA DISPOSAL

SUBSURFACE DIMMUS

East Waterway

FLOW DIRECTION



DREDGE PLAN AND DIMMU LAYOUT



PURPOSE: Provide adequate depth for moorage and movement of ships.

DATUM: NOS MLLW = 0.0'
ADJACENT PROPERTY OWNERS:
1) Port of Seattle

NEW WORK AND MAINTENANCE DREDGING

IN: (Terminal 30) East Waterway, Elliott Bay, Puget Sound
 AT: Seattle
 COUNTY OF: King STATE: WA
 APPLICATION BY: Port of Seattle
 SHEET 1 of 1 DATE: 06/14/01

Table 2. East Waterway Terminal 30 Dredging Project:
PSDDA Evaluation Summary

CHEMICAL NAME	Units	SL	BT	DMMU ID Rank	S40	S41	S42	S43	S44	S55	S56	S57	S58	S59	S60	D19	D20	D21	D22	D23	DMMU SL detection freq. #/16
					Conc.	VQ	Conc.	VQ	Conc.	VQ											
Mercury	mg/kg	0.41	1.5	2.3					0.522												1
Zinc	mg/kg	410		3,800		450															1
TBT ion (porewater)	ug/L	0.15	0.15		0.19	M	0.23	M				0.92	MB								4
Fluoranthene	ug/kg	1,700	4,600	30,000								2,400									1
Pyrene	ug/kg	2,600		16,000								3,400									1
2,4-Dimethylphenol	ug/kg	29		210														100			1
Total PCBs	ug/kg	130		3,100		150			182			260	195		205	170					6
Total PCBs (TOC- normalized)	mg/kg		38			8			10			12	15		27	11					0
Total Solids	%				71.7	62.1	66.1	66.5	57.5	73.2	65.4	62.8	75.6	72.7	71.6	70.1	72.5	76.4	69.8	72.8	
Total Volatile Solids	%				2.7	5.7	3.3	2.3	4.4	2.0	3.7	5.5	3.0	1.3	3.0	3.5	2.7	2.5	3.5	2.1	
Total Organic Carbon	%				1.6	2.0	1.1	1.2	1.8	0.8	1.0	2.1	1.3	0.7	0.8	1.5	0.8	0.9	0.8	0.8	
Total Ammonia	mg/kg				22	17	36	25	52	17	73	35	9.9	15	13	170	65	58	57	52	
Total Sulfides	mg/kg				170	160	340	350	83	220	140	630	28	13	110	800	44	22	U	69	22
Gravel	%				2.9	11.6	0.5	1.0	3.3	15.3	0.4	1.0	6.6	0.7	1.7	0.4	0.2	0.1	0.6	-	
Sand	%				72.9	35.0	45.7	44.1	26.2	53.8	46.4	57.3	66.0	86.2	78.2	54.4	51.0	47.8	81.8	60.2	
Silt	%				14.5	37.4	35.0	40.4	40.6	24.9	39.5	32.1	20.5	9.2	13.3	32.0	38.1	42.2	12.5	32.3	
Clay	%				9.7	16.2	18.8	14.6	30.0	5.9	13.9	9.6	7.1	3.7	6.8	13.0	10.5	9.9	5.3	7.4	
Fines (percent silt + clay)	%				24.2	53.6	53.8	55.0	70.6	30.8	53.4	41.7	27.6	12.9	20.1	45.0	48.6	52.1	17.8	39.7	
preferred reference match:	%				20.0	43.0	43.0	43.0	81.0	20.0	43.0	43.0	20.0	20.0	20.0	43.0	43.0	43.0	20.0	43.0	
Eohaustorius estuarius mortality:	%				8.0	8.0	2.0	3.0	15.0	3.0	7.0	2.0	4.0	12.0	8.0	5.0	8.0	2.0	2.0	3.0	
Mytilus galloprovincialis normal larvae:	%				37.4	49.6	23.1	31.4	29.5	26.4	43.5	51.3	13.8	30.3	27.6	57.9	38.9	18.3	35.5	18.7	
Neanthes arenaceodentata growth:	ind/mg/day				0.91	0.56	0.56	0.97	0.79	0.81	0.56	0.57	0.65	0.89	0.65	0.55	0.67	0.65	0.89	0.77	
Eohaustorius estuarius hits:																					
Mytilus galloprovincialis hits:					2H	2H	2H	2H	2H			2H	2H		2H	2H	2H	2H		2H	
Neanthes arenaceodentata hits:																					
Bioassay Determination: (P/F)					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
BTs eyesceeded:					yes	yes		yes				yes									
Bioaccumulation conducted:					yes	yes		yes				yes									
Bioaccumulation Determination:					P	P		P				P									
ML Rule exceeded:																					
PSDDA Determination:					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
DMMU Volume:	cy				4,040	4,040	4,050	3,630	2,990	4,130	3,930	4,090	3,890	4,020	3,590	11,750	12,010	11,390	11,800	11,920	
DMMU ID:					S40	S41	S42	S43	S44	S55	S56	S57	S58	S59	S60	D19	D20	D21	D22	D23	
Failed:																					Total Volume (cy)
Passed:																					0
Bioaccumulation (DMMU tested)					4,040	4,040	4,050	3,630	2,990	4,130	3,930	4,090	3,890	4,020	3,590	11,750	12,010	11,390	11,800	11,920	101,270
					4,040	4,040	4,050	3,630	2,990	4,130	3,930	4,090	3,890	4,020	3,590	11,750	12,010	11,390	11,800	11,920	15,800

Legend: 1H = one hit failure; 2H = two hit failure; P = Pass (suitable for UCOWD); F = Failure (Unsuitable for UCOWD); UCOWD = unconfined-open-water-disposal; U = undetected at the reported concentration; VQ = Validation Qualifier; UJ = undetected above sample quantitation limit; M = estimated value with low spectral match; B = possible blank contamination; BT = bioaccumulation trigger; SL = screening level (lower chemical guideline)

Table 4. Worst Case Bioaccumulation Interpretation Summary (Adjusted values)

			DMMU S40										DMMU S41									
			Macoma nasuta					Nephtys caecoides					Macoma nasuta				Nephtys caecoides					
			DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 W)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 W)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
CHEMICAL NAME	Units	Guideline	284	284	20.3	yes	yes	57.8	57.8	72.9	no	yes	222	284	33.4	yes	yes	44.2	56.6	65.0	no	yes
TBT ion (as TBT)	ug/kg-dw	3,000	DMMU S43										DMMU S57									
			Macoma nasuta					Nephtys caecoides					Macoma nasuta				Nephtys caecoides					
			DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
			CHEMICAL NAME	Units	Guideline	71.6	91.6	33.4	no	yes	73.0	93.4	65.0	no	yes	194	380	33.4	yes	yes	61.4	120
TBT ion (as TBT)	ug/kg-dw	3,000	DMMU S43										DMMU S57									